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

SLOS183D - FEBRUARY 1997 - REVISED OCTOBER 2012

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/µs 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 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.



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



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TLE2141 AVAILABLE OPTIONS

		P.	ACKAGED DEVICES	3
T _A	V _{IO} max AT 25°C	SMALL OUT- LINE [†] (D) TLE2141ACD TLE2141CD	CERAMIC DIP (JG)	PLASTIC DIP (P)
0°C to 70°C	500 μV 900 μV		_	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			
T _A	V _{IO} max AT 25°C	SMALL OUTLINE [†] (D)	CHIP CARRIER (FK)	CERAMIC DIP (JG)	PLASTIC DIP (P)	TSSOP [‡] (PW)	CERAMIC FLAT PACK (U)
	750 μV	TLE2142ACD	_	_	TLE2142ACP	_	_
0°C to 70°C	1200 μV	TLE2142CD	_	_	TLE2142CP	TLE2142CPWLE	_
10001 10500	750 μV	TLE2142AID	_	_	TLC2142AIP	_	_
-40°C to 105°C	1200 μV	TLE2142ID	_	_	TLC2142IP	_	_
5500 to 40500	750 μV	TLE2142AMD	TLE2142AMFK	TLE2142AMJG	_	_	TLE2142AMU
-55°C to 125°C	1200 μV	TLE2142MD	TLE2142MFK	TLE2142MJG	_	_	TLE2142MU

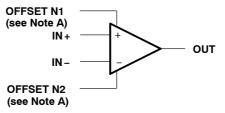
[†] The D packages are available taped and reeled. Add R suffix to device type (e.g., TLC2142ACDR).

TLE2144 AVAILABLE OPTIONS

	V		PACKAGED D	DEVICES	
T _A	V _{IO} max AT 25°C	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



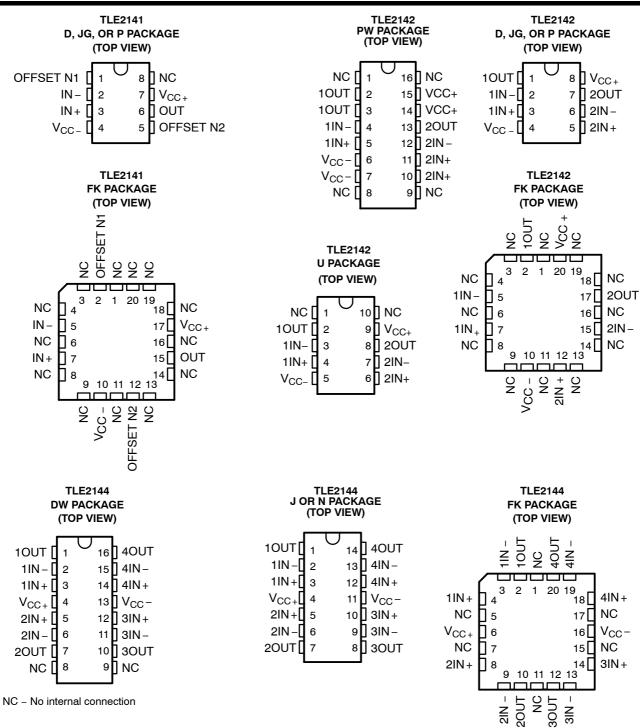
NOTES: A. OFFSET N1 AND OFFSET N2 are only availiable on the TLE2241x devices.

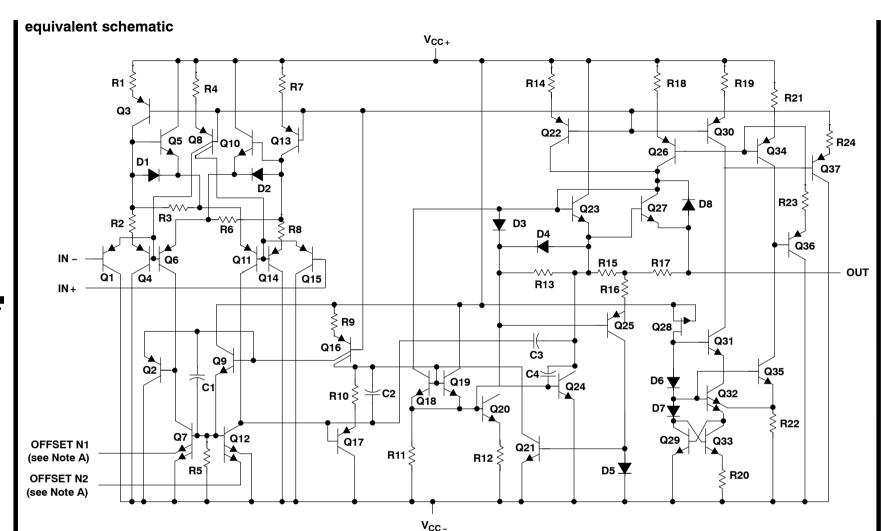


[‡] The PW packages are available left-ended taped and reeled. Add LE the suffix to device type (e.g., TLC2142CPWLE).

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NOTE A: OFFSET N1 AND OFFSET N2 are only available on the TLE2141x devices.

ACTU	AL DEVICE CO	MPONENT COU	NT
COMPONENT	TLE2141	TLE2142	TLE2144
Transistors	46	65	130
Resistors	24	43	86
Diodes	8	14	28
Capacitors	4	8	16
Epi-FET	1	1	2

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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)		
Output current, I _O		
Total current into V _{CC+}		
Total current out of V _{CC}		
Duration of short-circuit current at (or below) 25 °C (see	,	
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		260°C
Lead temperature 1,6 mm (1/16 inch) from case for 60		

[†] 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 SU	FFIX	I SUFFIX		M SUFFIX		
		MIN	MAX	MIN	MAX	MIN	MAX	UNIT
Supply voltage, V _{CC±}	Supply voltage, V _{CC±}		±22	±2	±22	±2	±22	V
Common and the Lotter W	V _{CC} = 5 V	0	2.9	0	2.7	0	2.7	.,
Common-mode input voltage, V_{IC}	$V_{CC\pm} = \pm 15 \text{ V}$	-15	12.9	-15	12.7	-15	12.7	V
Operating free-air temperature, T _A		0	70	-40	105	-55	125	°C



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

	PARAMETER	TEST CONDITIONS	- +	TL	E21410	;	TL	E2141A	С	
	PARAMETER	TEST CONDITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
.,	land affect values		25°C		225	1400		200	1000	
V_{IO}	Input offset voltage		Full range			1700			1300	μV
α_{VIO}	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 offert somest	V _{IC} = 2.5 V	25°C		8	100		8	100	^
I _{IO}	Input offset current		Full range			150			150	nA
l	Input higo ourrent		25°C		-0.8	-2		-0.8	-2	^
I _{IB}	Input bias current		Full range			-2.1			-2.1	μА
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		V
VICK	voltage range	115 - 50 52	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		
		10H = - 130 μΑ	Full range	3.8			3.8			
V _{OH}	High-level output voltage	I _{OH} = – 1.5 mA	25°C	3.8	4		3.8	4		V
VOH	riigir level oatpat voltage	10H = 1.0 11/1	Full range	3.7			3.7			·
		I _{OH} = – 15 mA	25°C	3.2	3.7		3.2	3.7		
		Юн — 10 них	Full range	3.2			3.2			
		I _{OL} = 150 μA	25°C		75	125		75	125	
		000 1	Full range			150			150	mV
V_{OL}	Low-level output voltage	I _{OL} = 1.5 mA	25°C		150	225		150	225	
02	, ,	02	Full range			250			250	
		I _{OL} = 15 mA	25°C		1.2	1.6		1.2	1.6	V
			Full range	50	000	1.7		000	1.7	
A_{VD}	Large-signal differential voltage amplification	$V_{CC} = \pm 2.5 \text{ V}, R_L = 2 \text{ k}\Omega,$ $V_O = 1 \text{ V to } -1.5 \text{ V}$	25°C	50	220		50	220		V/mV
	Input resistance	V() = 1 V to = 1.5 V	Full range 25°C	25	70		25	70		ΜΩ
r _i	Input resistance		25°C		2.5			2.5		pF
C _i	Open-loop output	f = 1 MHz	25°C		30			30		ρr Ω
Z ₀	impedance	1 - 1 1411 12								34
CMRR	Common-mode rejection	$V_{IC} = V_{ICR}min, R_S = 50 \Omega$	25°C	85	118		85	118		dB
5.,,,,,,,,,	ratio	10 - 10Himi, 118 - 00 22	Full range	80			80			45
k _{SVR}	Supply-voltage rejection	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V},$	25°C	90	106		90	106		dB
··ovn	ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$R_S = 50 \Omega$	Full range	85			85			
Icc	Supply current	$V_O = 2.5 \text{ V}$, No load,	25°C		3.4	4.4		3.4	4.4	mA
	,	V _{IC} = 2.5 V	Full range			4.6			4.6	

[†] Full range is 0°C to 70°C.



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

	DADAMETED		IDITIONS	Т	LE21410	;	TL	E2141A	С	
	PARAMETER	TEST CON	NDITIONS	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
	Calling 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
.,	Carried and increase and a continue	$R_S = 20 \Omega$,	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	Z		0.48			0.48		
V _{N(PP)}	noise voltage	f = 0.1 Hz to 10	Hz		0.51			0.51		μV
	En industrial trades a social	f = 10 Hz			1.92			1.92		- A /-/ITE
I _n	Equivalent input noise current	f = 1 kHz			0.5			0.5		pA/√Hz
THD + N	Total harmonic distortion plus noise	$V_{O} = 1 \text{ V to 3 V,}$ $A_{VD} = 2,$	$R_L = 2 k\Omega^{\dagger}$, $f = 10 kHz$		0.0052%		C	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	$C_L = 100 \text{ pF}^{\dagger}$,		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
φ _m	Phase margin at unity gain	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF [†]		57°			57°		

 $^{^{\}dagger}$ R_L and C_L terminated to 2.5 V.

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

	PARAMETER	TEST CON	DITIONS	- +	Т	LE21410		TL	.E2141A	С	
	PANAMETEN	TEST CON	DITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
.,	lovet effect velters			25°C		200	900		175	500	
V _{IO}	Input offset voltage			Full range			1300			800	μV
α_{VIO}	Temperature coefficient of input offset voltage	V _{IC} = 0,	$R_S = 50 \Omega$,	Full range		1.7			1.7		μV/°C
	landa Maala waal	V _O = 0		25°C		7	100		7	100	- 4
l _{IO}	Input offset current			Full range			150			150	nA
	land bing a month			25°C		-0.7	-1.5		-0.7	-1.5	4
I _{IB}	Input bias current			Full range			-1.6			-1.6	μ A
	Common-mode input			25°C	-15 to 13	-15.3 to 13.2		-15 to 13	-15.3 to 13.2		
V _{ICR}	voltage range	$R_S = 50 \Omega$		Full range	-15 to 12.9	-15.3 to 13.1		-15 to 12.9	-15.3 to 13.1		V
				25°C	13.8	14.1		13.8	14.1		
		I _O = –150 μA		Full range	13.7			13.7			
	Maximum positive peak			25°C	13.7	14		13.7	14		
V _{OM+}	output voltage swing	$I_{O} = -1.5 \text{ mA}$		Full range	13.6			13.6			V
				25°C	13.1	13.7		13.1	13.7		
		$I_{O} = -15 \text{ mA}$		Full range	13			13			
				25°C	-14.7	-14.9		-14.7	-14.9		
		I _O = 150 μA		Full range	-14.6			-14.6			
. ,	Maximum negative			25°C	-14.5	-14.8		-14.5	-14.8		.,
V_{OM-}	peak output voltage swing	I _O = 1.5 mA		Full range	-14.4			-14.4			V
	g			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	450		100	450		Man
A_{VD}	voltage amplification	$V_0 = \pm 10 \text{ V}$		Full range	75			75			V/mV
r _i	Input resistance	$R_L = 2 k\Omega$		25°C		65			65		$M\Omega$
c _i	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	V V ::	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
k _{SVR}	Supply-voltage rejection ratio	$V_{CC\pm} = \pm 2.5 \text{ V to}$ $R_S = 50 \Omega$	±15 V,	25°C	90	106		90	106		dB
	$(\Delta V_{CC\pm}/\Delta V_{IO})$	1 IS - 30 22	•	Full range	85			85			
loo	Short-circuit output	V _O = 0	$V_{ID} = 1 V$	25°C	-25	-50		-25	-50		mA
los	current	¥0 = 0	$V_{ID} = -1 V$	200	20	31		20	31		111/
lcc	Supply current	V _O = 0,	No load	25°C		3.5	4.5		3.5	4.5	mA
ICC	Supply Surroll	-0 - 0,	. 10 1044	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°C

	DADAMETED		UDITIONS.	TL	E21410	;	TL	E2141A	С	
	PARAMETER	TEST CON	NDITIONS	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
	Calling 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
V	E. i dedica basica allesa	$R_S = 20 \Omega$,	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 H	z		0.48			0.48		.,
$V_{N(PP)}$	noise voltage	f = 0.1 Hz to 10	Hz		0.51			0.51		μV
		f = 10 Hz			1.89			1.89		A / /!!
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
φ _m	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 V (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	- +	TL	E21420		TL	E2142A	С	
	PARAMETER	TEST CONDITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
.,	land affect colleges		25°C		220	1900		200	1500	
V_{IO}	Input offset voltage		Full range			2200			1800	μV
α_{VIO}	Temperature coefficient of input offset voltage	V_0 = 2.5 V, R_S = 50 Ω,	Full range		1.7			1.7		μV/°C
	land affect a mont	V _{IC} = 2.5 V	25°C		8	100		8	100	^
I _{IO}	Input offset current		Full range			150			150	nA
١.	Innut hing august		25°C		-0.8	-2		-0.8	-2	^
I _{IB}	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		V
VICK	voltage range	115 - 30 22	Full range	0 to 2.9			0 to 2.9			•
		I _{OH} = -150 μA	25°C	3.9	4.1		3.9	4.1		
		10Η = - 130 μΛ	Full range	3.8			3.8			
V _{OH}	High-level output voltage	I _{OH} = –1.5 mA	25°C	3.8	4		3.8	4		V
VOH	riigii-ievei oatpat voitage	10H = -1.0 IIIA	Full range	3.7			3.7			V
		I _{OH} = –15 mA	25°C	3.4	3.7		3.4	3.7		
-		10H = 10 H/V	Full range	3.4			3.4			
		I _{OL} = 150 μA	25°C		75	125		75	125	
		10L 111 pm 1	Full range			150			150	mV
V_{OL}	Low-level output voltage	I _{OL} = 1.5 mA	25°C		150	225		150	225	
OL	1 3	OL .	Full range			250			250	
		I _{OL} = 15 mA	25°C		1.2	1.4		1.2	1.4	V
		OL .	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
	voltage amplification	V _O = 1 V to –1.5 V	Full range	25			25			
r _i	Input resistance		25°C		70			70		MΩ
c _i	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
OWII II 1	rejection ratio	AIC - AICHHIII, LIZ - 20 77	Full range	80			80			GD.
kovo	Supply-voltage rejection	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V},$	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			GD.
I _{CC}	Supply current	$V_0 = 2.5 \text{ V}$, No load,	25°C		6.6	8.8		6.6	8.8	mA
.00	and in 000 to 7000	V _{IC} = 2.5 V	Full range			9.2			9.2	1117 \

[†] Full range is 0°C to 70°C.



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

				TI	E21420	2	TL	E2142A	С	
	PARAMETER	TEST CO	NDITIONS	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	Established to the state of the same	$R_S = 20 \Omega$,	f = 10 Hz		15			15		- VI/II
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		.,
$V_{N(PP)}$	input noise voltage	f = 0.1 Hz to 10 H	-lz		0.51			0.51		μV
		f = 10 Hz			1.92			1.92		A / /!!
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 kHz	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	$R_L = 2 k\Omega^{\dagger}$, $f = 100 \text{ kHz}$	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
φ _m	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_{CC^\pm} = ± 15 V (unless otherwise noted)

	PARAMETER	TEST CON	IDITIONS	- +	Т	LE21420		TL	E2142A	С	
	PANAMETEN	TEST CON	DITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
.,	land affect valle as			25°C		290	1200		275	750	
V_{IO}	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
	l l	V _O = 0	,	25°C		7	100		7	100	- 4
I _{IO}	Input offset current			Full range			150			150	nA
	land delica comment			25°C		-0.7	-1.5		-0.7	-1.5	^
I _{IB}	Input bias current			Full range			-1.6			-1.6	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		٧
V _{ICR}	voltage range	ng = 30 sz		Full range	-15 to 12.9	-15.3 to 13.1		-15 to 12.9	-15.3 to 13.1		V
		I _O = -150 μA		25°C	13.8	14.1		13.8	14.1		
		10 = - 150 μΑ		Full range	13.7			13.7			
V	Maximum positive peak	I _O = – 1.5 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 mA		25°C	13.3	13.7		13.3	13.7		
		10 = - 15 IIIA		Full range	13.2			13.2			
		1 150 4		25°C	-14.7	-14.9		-14.7	-14.9		
		I _O = 150 μA		Full range	-14.6			-14.6			
l.,	Maximum negative peak	1. 1.5 1		25°C	-14.5	-14.8		-14.5	-14.8		V
V_{OM-}	output voltage swing	$I_{O} = 1.5 \text{ mA}$		Full range	-14.4			-14.4			V
		15 4		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	450		100	450		\//\/
A_{VD}	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		$M\Omega$
c _i	Input capacitance			25°C		2.5			2.5		pF
z _o	Open-loop output impedance	f = 1 MHz		25°C		30			30		Ω
01455	Common-mode	V _{IC} = V _{ICR} min,	i	25°C	85	108		85	108		.15
CMRR	rejection ratio	$R_S = 50 \Omega$		Full range	80			80			dB
	Supply-voltage rejection	V _{CC±} = ± 2.5 \	/ to ±15 V,	25°C	90	106		90	106		.15
k _{SVR}	ratio $(\Delta V_{CC\pm}/\Delta V_{IO})$	$R_S = 50 \Omega$		Full range	85			85			dB
	Object along the state of	V 0	V _{ID} = 1 V	0500	-25	-50		-25	-50		A
los	Short-circuit output current	$V_O = 0$	V _{ID} = -1 V	25°C	20	31		20	31		mA
	0 1 :	., .		25°C		6.9	9		6.9	9	_
Icc	Supply current	$V_{O} = 0$,	No load	Full range			9.4			9.4	mA

[†] Full range is 0°C to 70°C.



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

	24244555	TEOT 001	IDITIONS	TI	LE21420	;	TL	E2142A	С	
	PARAMETER	TEST CON	NDITIONS	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
	Ostilias Pas	$A_{VD} = -1$,	To 0.1%		0.34			0.34		_
t _s	Settling time	10-V step	To 0.01%		0.4			0.4		μs
V	Established to the allow	$R_S = 20 \Omega$,	f = 10 Hz		15			15		->4/
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		,,
V _{N(PP)}	noise voltage	f = 0.1 Hz to 10	Hz		0.51			0.51		μV
		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 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	$R_L = 2 k\Omega_{r}$, $f = 100 \text{ kHz}$	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
φ _m	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 V (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	T _A †	TI	E21440)	TL	E2144A	С	
	PANAMETEN	TEST CONDITIONS	'A'	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
.,	land effect values		25°C		0.5	3.8		0.5	3	mV
V_{IO}	Input offset voltage		Full range			4.4			3.6	mv
α_{VIO}	Temperature coefficient of input offset voltage	V _O = 2.5 V,	Full range		1.7			1.7		μV/°C
ĺ.	land offert coment	$V_{IC} = 2.5 \text{ V}$ $R_S = 50 \Omega$,	25°C		8	100		8	100	4
I _{IO}	Input offset current		Full range			150			150	nA
ĺ.	land bing a mont		25°C		-0.8	-2		-0.8	-2	A
I _{IB}	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	TTS = 30 22	Full range	0 to 2.9			0 to 2.9			v
		1504	25°C	3.9	4.1		3.9	4.1		
		I _{OH} = -150 μA	Full range	3.8			3.8			
l.,	High-level output	15 m A	25°C	3.8	4		3.8	4		V
V _{OH}	voltage	I _{OH} = –1.5 mA	Full range	3.7			3.7			V
		1 45 4	25°C	3.4	3.7		3.4	3.7		
		I _{OH} = –15 mA	Full range	3.4			3.4			
		1504	25°C		75	125		75	125	
		I _{OL} = 150 μA	Full range			150			150	mV
l.,	Low-level output	1 1 5 m A	25°C		150	225		150	225	mv
V_{OL}	voltage	I _{OL} = 1.5 mA	Full range			250			250	
		1 15 mA	25°C		1.2	1.6		1.2	1.6	٧
		I _{OL} = 15 mA	Full range			1.7			1.7	V
_	Large-signal differential	$V_{CC} = \pm 2.5 \text{ V}, \qquad R_L = 2 \text{ k}\Omega,$	25°C	50	95		50	95		\ //\ /
A _{VD}	voltage amplification	$V_0 = 1 \text{ V to } -1.5 \text{ V}$	Full range	25			25			V/mV
r _i	Input resistance		25°C		70			70		MΩ
c _i	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 D 500	25°C	85	118		85	118		-ID
CMRR	rejection ratio	$V_{IC} = V_{ICR}$ min, $R_S = 50 \Omega$	Full range	80			80			dB
k _{SVR}	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			
loc	Supply current	$V_O = 2.5 \text{ V}$, No load,	25°C		13.2	17.6		13.2	17.6	mA
I _{CC}	Сарріу сипепі	V _{IC} = 2.5 V	Full range			18.5			18.5	111/

[†] 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 CO	NDITIONS	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
	O-What Park	$A_{VD} = -1$,	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		-VI/ II
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 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 / /III
In	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	0.0	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
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
φ _m	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_{CC^\pm} = ± 15 V (unless otherwise noted)

	24244555	TEOT 001	DITIONS		Т	LE21440	;	TL	E2144A	С	
	PARAMETER	TEST CON	DITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
.,	Innut offeet veltere			25°C		0.6	2.4		0.5	1.5	mV
V _{IO}	Input offset voltage			Full range			3.2			2.4	IIIV
α_{VIO}	Temperature coefficient of input offset voltage	V _{IC} = 0,	$R_S = 50 \Omega$	Full range		1.7			1.7		μV/°C
	les leffeste seed	$V_{O} = 0$,	25°C		7	100		7	100	- 4
I _{IO}	Input offset current			Full range			150			150	nA
Ī	Innet him accurrent			25°C		-0.7	-1.5		-0.7	-1.5	4
I _{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		
V _{ICR}	voltage range	R _S = 50 Ω		Full range	-15 to 12.9	-15.3 to 13.1		-15 to 12.9	-15 to 13.1		V
		1. 150 4		25°C	13.8	14.1		13.8	14.1		
		$I_{O} = -150 \mu\text{A}$		Full range	13.7			13.7			
l.,	Maximum positive peak	1 454		25°C	13.7	14		13.7	14		.,
V _{OM+}	output voltage swing	$I_{O} = -1.5 \text{ mA}$		Full range	13.6			13.6			V
				25°C	13.1	13.7		13.1	13.7		
		$I_O = -15 \text{ mA}$		Full range	13			13			
		1 150 4		25°C	-14.7	-14.9		-14.7	-14.9		
		I _O = 150 μA		Full range	-14.6			-14.6			
.,	Maximum negative			25°C	-14.5	-14.8		-14.5	-14.8		.,
V_{OM-}	peak output voltage swing	I _O = 1.5 mA		Full range	-14.4			-14.4			V
	······9			25°C	-13.4	-13.8		-13.4	-13.8		
		I _O = 15 mA		Full range	-13.3			-13.3			
	Large-signal differential			25°C	100	170		100	170		
A_{VD}	voltage amplification	$V_O = \pm 10 \text{ V}$		Full range	75			75			V/mV
r _i	Input resistance	$R_L = 2 k\Omega$		25°C		65			65		МΩ
c _i	Input capacitance			25°C		2.5			2.5		pF
z _o	Open-loop output impedance	f = 1 MHz		25°C		30			30		Ω
OME	Common-mode		D 500	25°C	85	108		85	108		-15
CMRR	rejection ratio	$V_{IC} = V_{ICR}min,$	$R_S = 50 \Omega$	Full range	80			80			dB
k _{SVR}	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			
laa	Short-circuit output	V 0	$V_{ID} = 1 V$	25°C	-25	-50		-25	-50		m^
los	current	V _O = 0	$V_{ID} = -1 V$	25.0	20	31		20	31		mA
ļ	Supply ourrest		No load	25°C		13.8	18		13.8	18	m^
I _{CC}	Supply current	$V_{O} = 0$,	เพบ เบสน	Full range			18.8			18.8	mA

 $^{^{\}dagger}$ Full range is 0°C to 70°C.



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

	DADAMETED	TEOT 001	UDITIONO	Т	LE2144C	;	TL	.E2144A0	2	LINUT
	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
	O-III' I'	$A_{VD} = -1$,	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) // /II
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	łz		0.48			0.48		
$V_{N(PP)}$	noise voltage	f = 0.1 Hz to 10	Hz		0.51			0.51		μV
		f = 10 Hz			1.89			1.89		A / /
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	$V_{O(PP)} = 20 \text{ V},$ $A_{VD} = 1,$	$R_L = 2 k\Omega$, $C_L = 100 pF$		668			668		kHz
φ _m	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 V (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	- +	T	LE2141	l	TL	E2141A	VI.	
	PARAMETER	TEST CONDITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
, , , , , , , , , , , , , , , , , , ,	land offertualisms		25°C		225	1400		200	1000	
V_{IO}	Input offset voltage		Full range			1900			1500	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
	landa Maria a saad	V _{IC} = 2.5 V	25°C		8	100		8	100	- 4
I _{IO}	Input offset current		Full range			200			200	nA
	land bing a word		25°C		-0.8	-2		-0.8	-2	0
I _{IB}	Input bias current		Full range			-2.2			-2.2	μА
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
VICH	voltage range	118 - 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 μA		3.9	4.1		3.9	4.1		
		I _{OH} = – 1.5 mA	25°C	3.8	4		3.8	4		
V _{OH}	High-level output voltage	I _{OH} = –15 mA		3.2	3.7		3.2	3.7		V
VOH	r light-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		3.3			3.3			
		I _{OL} = 150 μA			75	125		75	125	mV
		I _{OL} = 1.5 μA	25°C		150	225		150	225	
V _{OL}	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	
		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
, (0)	voltage amplification	V _O = 1 V to – 1.5 V	Full range	10			10			,
r _i	Input resistance		25°C		70			70		MΩ
c _i	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
OWINK	rejection ratio	VIC = VICRIIIIII, INS = 50 12	Full range	80			80			uБ
ka:=	Supply-voltage rejection	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V},$	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			uБ
loo	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	111/7

[†] Full range is –40°C to 105°C.



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

				-	TLE21411		Т	LE2141A	J	
	PARAMETER	TEST CO	NDITIONS	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	E. Salastina Lada albana	$R_S = 20 \Omega$,	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	Hz		0.51			0.51		μV
		f = 10 Hz			1.92			1.92		- 4 / /
I _n	Equivalent input noise current	f = 1 kHz			0.5			0.5		pA/√ Hz
THD + N	Total harmonic distortion plus noise	$V_{O} = 1 \text{ V to 3 V},$ $A_{VD} = 2,$	$R_L = 2 k\Omega^{\dagger}$, $f = 10 kHz$		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	$C_L = 100 \text{ pF}^{\dagger},$		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
φ _m	Phase margin at unity gain	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF [†]		57°			57°		

 $^{^{\}dagger}$ R_L and C_L terminated to 2.5 V.

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

	PARAMETER	TEST CONDITION	ONE	- +	Т	LE2141I		ΤL	E2141A	J	
	PANAMETEN	TEST CONDITION	ONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
.,	land the office to college			25°C		200	900		175	500	
V _{IO}	Input offset voltage			Full range			1500			1000	μV
α_{VIO}	Temperature coefficient of input offset voltage	$V_{IC} = 0, R_S$	= 50 Ω,	Full range		1.7			1.7		μV/°C
	l l - #l	$V_0 = 0$		25°C		7	100		7	100	- 4
I _{IO}	Input offset current			Full range			200			200	nA
	land this amount			25°C		-0.7	-1.5		-0.7	-1.5	0
I _{IB}	Input bias current			Full range			-1.7			-1.7	μΑ
V _{ICR}	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		٧
VICH	voltage range	115 - 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			
		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		
l.,	Maximum negative peak	$I_O = 15 \text{ mA}$			-13.4	-13.8		-13.4	-13.8		V
V _{OM} –	output voltage swing	$I_O = 100 \mu\text{A}$			-14.6			-14.6			V
		$I_O = 1 \text{ mA}$		Full range	-14.5			-14.5			
		I _O = 10 mA			-13.4			-13.4			
	Large-signal differential	V 140V D	010	25°C	100	450		100	450		\//\/
A_{VD}	voltage amplification	$V_0 = \pm 10 \text{ V}, R_L =$	= 5 K71	Full range	40			40			V/mV
r _i	Input resistance			25°C		65			65		MΩ
c _i	Input capacitance			25°C		2.5			2.5		pF
z _o	Open-loop output impedance	f = 1 MHz		25°C		30			30		Ω
OMEE	Common-mode	V V : 5	50 C	25°C	85	108		85	108		-15
CMRR	rejection ratio	$V_{IC} = V_{ICR}min, R_S =$	= 5U Ω	Full range	80			80			dB
	Supply-voltage rejection	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 1$	15 V,	25°C	90	106		90	106		-15
k _{SVR}	ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$R_S = 50 \Omega$		Full range	85			85			dB
	Short-circuit output	V _{ID}	= 1 V	0500	-25	-50		-25	-50		4
los	current	$V_O = 0$ V_{ID}	= -1 V	25°C	20	31		20	31		mA
	Owner and	V 0	اممما	25°C		3.5	4.5		3.5	4.5	4
Icc	Supply current	$V_O = 0$, No I	load	Full range			4.7			4.7	mA
				•							

[†] Full range is -40°C to 105°C.



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

	242445752			Τι	E2141I		TL	E2141A	J	
	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		Missa
SR-	Negative slew rate	C _L = 500 pF		27	42		27	42		V/μs
	Calling 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
V	Establish basis allow	$R_S = 20 \Omega$,	f = 10 Hz		15			15		-VI/II
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		.,
V _{N(PP)}	noise voltage	f = 0.1 Hz to 10 l	-lz		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 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
φ _m	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 V (unless otherwise noted)

	DADAMETED	TEST SON	DITIONS	_ +	Т	LE2142I		TL	E2142A	d .	
	PARAMETER	TEST CON	DITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
V	land affect wellows			25°C		220	1900		220	1500	/
V_{IO}	Input offset voltage			Full range			2400			2000	μV
α_{VIO}	Temperature coefficient of input offset voltage	V _O = 2.5 V,	$R_S = 50 \Omega$,	Full range		1.7			1.7		μV/°C
	loout effect oursest	V _{IC} = 2.5 V		25°C		8	100		8	100	~^
I _{IO}	Input offset current			Full range			200			200	nA
1	Input bias current			25°C		-0.8	-2		-0.8	-2	^
I _{IB}	input bias current			Full range			-2.2			-2.2	μA
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		V
VICH	voltage range	11S = 30 s2		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		
V _{OH}	High-level output voltage	$I_{OH} = -15 \text{ mA}$			3.4	3.7		3.4	3.7		V
VOH	nigh-level output voltage	$I_{OH} = 100 \mu A$			3.8			3.8			v
		I _{OH} = 1 mA		Full range	3.7			3.7			
		$I_{OH} = 10 \text{ mA}$			3.5			3.5			
		$I_{OI} = 150 \mu\text{A}$				75	125		75	125	mV
		I_{OL} = 1.5 mA		25°C		150	225		150	225	111 V
V _{OL}	Low-level output voltage	I_{OL} = 15 mA				1.2	1.4		1.2	1.4	V
VOL.	Low-level output voltage	$I_{OL} = 100 \mu\text{A}$					175			175	mV
		$I_{OL} = 1 \text{ mA}$		Full range			225			225	IIIV
		I_{OL} = 10 mA					1.2			1.2	V
A_{VD}	Large-signal differential	$V_{IC} = \pm 2.5 V$,	$R_L = 2 k\Omega$,	25°C	50	220		50	220		V/mV
~ VD	voltage amplification	$V_0 = 1 \text{ V to } -1.5$	5 V	Full range	10			10			V/IIIV
rį	Input resistance			25°C		70			70		MΩ
c _i	Input capacitance			25°C		2.5			2.5		pF
z _o	Open-loop output impedance	f = 1 MHz		25°C		30			30		Ω
OMEE	Common-mode rejection	V V	D 500	25°C	85	118		85	118		40
CMRR	ratio	$V_{IC} = V_{ICR}min,$	$R_S = 50 \Omega$	Full range	80			80			dB
1.	Supply-voltage rejection	$V_{CC\pm} = \pm 2.5 \text{ V}$	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
1	Supply current	V _O = 2.5 V,	No load,	25°C		6.6	8.8		6.6	8.8	m A
I _{CC}	оирріу сипепт	V _{IC} = 2.5 V		Full range			9.2			9.2	mA

[†] Full range is – 40°C to 105°C.



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

		7707.001	DITIONS		TLE2142I		Т	LE2142A		
	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 1111 111	$A_{VD} = -1$,	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) ()
V_n	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		
$V_{N(PP)}$	input noise voltage	f = 0.1 Hz to 10 H	-lz		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	$V_{O} = 1 \text{ V to 3 V},$ $A_{VD} = 2,$	$R_L = 2 k\Omega^{\dagger},$ 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 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
φ _m	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_{CC^\pm} = $\pm 15~V$ (unless otherwise noted)

	242445752		NIDITION O		T	LE2142		Т	LE2142I		
	PARAMETER	IESI CC	ONDITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
.,				25°C		290	1200		275	750	
V_{IO}	Input offset voltage			Full range			1800			1400	μV
ανιο	Temperature coefficient of input offset voltage	V _{IC} = 0,	$R_S = 50 \Omega$,	Full range		1.7			1.7		μV/°C
		$V_0 = 0$		25°C		7	100		7	100	- 4
I _{IO}	Input offset current			Full range			200			200	nA
	land this a surrent			25°C		-0.7	-1.5		-0.7	-1.5	^
I _{IB}	Input bias current			Full range			-1.7			-1.7	μΑ
V _{ICR}	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		٧
VICH	voltage range	115 - 30 22		Full range	-15 to 12.7	-15.3 to 12.9		-15 to 12.7	-15.3 to 12.9		•
		$I_{O} = -150 \mu$ A	١		13.8	14.1		13.8	14.1		
		$I_0 = -1.5 \text{ m/s}$	A	25°C	13.7	14		13.7	14		
Vall	Maximum positive peak	$I_0 = -15 \text{ mA}$			13.3	13.7		13.3	13.7		V
V _{OM+}	output voltage swing	$I_{O} = -100 \mu$	4		13.7			13.7			V
		$I_0 = -1 \text{ mA}$		Full range	13.6			13.6			
		$I_0 = -10 \text{ mA}$			13.3			13.3			
		$I_O = 150 \mu A$			-14.7	-14.9		-14.7	-14.9		
		$I_O = 1.5 \text{ mA}$		25°C	-14.5	-14.8		-14.5	-14.8		
l.,	Maximum negative peak	$I_O = 15 \text{ mA}$			-13.4	-13.8		-13.4	-13.8		V
V_{OM-}	output voltage swing	$I_O = 100 \mu A$			-14.6			-14.6			V
		I _O = 1 mA		Full range	-14.5			-14.5			
		I _O = 10 mA			-13.4			-13.4			
	Large-signal differential			25°C	100	450		100	450		
A_{VD}	voltage amplification	$V_0 = \pm 10 \text{ V},$	$H_L = 2 \text{ K}\Omega$	Full range	40			40			V/mV
r _i	Input resistance			25°C		65			65		MΩ
c _i	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 rejection	$V_{IC} = V_{ICR}m$	in	25°C	85	108		85	108		
CMRR	ratio	$R_S = 50 \Omega$		Full range	80			80			dB
	Supply-voltage rejection	V _{CC±} = ±2.5	V to ±15 V,	25°C	90	106		90	106		
k _{SVR}	ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$R_S = 50 \Omega$	•	Full range	85			85			dB
	a.	., -	V _{ID} = 1 V		-25	-50		-25	-50		_
los	Short-circuit output current	V _O = 0	V _{ID} = -1 V	25°C	20	31		20	31		mA
	0 1 :	., .	.	25°C		6.9	9		6.9	9	
I _{CC}	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 = $25^{\circ}C$

	2424455		IDITIONS	Т	LE2142I		TL	E2142A	I	
	PARAMETER	TEST CON	NDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$A_{VD} = -1$,	$R_L = 2 k\Omega$,	30	45		30	45		.,,
SR-	Negative slew rate	C _L = 500 pF		30	42		30	42		V/μs
	O-III' I'	$A_{VD} = -1$,	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		->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		
$V_{N(PP)}$	noise voltage	f = 0.1 Hz to 10	Hz		0.51			0.51		μV
		f = 10 Hz			1.89			1.89		A / / ! ! !
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 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
φ _m	Phase margin at unity gain	$R_L = 2 k\Omega$,	C _L = 100 pF		58°			58°		

TLE2144l electrical characteristics at specified free-air temperature, V_{CC} = 5 V (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	T +	TI	LE2144I		TL	E2144A	1	
	PANAMETEN	TEST CONDITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
V	Innut offeet veltege		25°C		0.5	3.8		0.5	3	mV
V _{IO}	Input offset voltage		Full range			4.8			4	IIIV
ανιο	Temperature coefficient of input offset voltage	$V_{IC} = 0,$ $R_{S} = 50 \Omega,$	Full range		1.7			1.7		μV/°C
	Input offset current	$V_0 = 0$	25°C		8	100		8	100	nA
I _{IO}	input onset current		Full range			200			200	IIA
l.o	Input bias current		25°C		-0.8	-2		-0.8	-2	μΑ
I _{IB}	input bias current		Full range			-2.2			-2.2	μΛ
V	Common-mode input	$R_S = 50 \Omega$	25°C	0 to 3	-0.3 to 3.2		0 to 3	-0.3 to 3.2		V
V _{ICR}	voltage range	ng = 30 12	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		
V	High-level	$I_{OH} = -15 \text{ mA}$		3.4	3.7		3.4	3.7		V
V _{OH}	output voltage	$I_{OH} = 100 \mu\text{A}$		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 μ A			75	125		75	125	mV
		$I_{OL} = 1.5 \mu\text{A}$	25°C		150	225		150	225	IIIV
V _{OL}	Low-level	I _{OL} = 15 mA			1.2	1.6		1.2	1.6	V
VOL	output voltage	I_{OL} = 100 μ A				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	$V_{IC} = \pm 2.5 \text{ V}, \qquad \qquad R_L = 2 \text{ k}\Omega,$	25°C	50	95		50	95		V/mV
~VD	voltage amplification	$V_0 = 1 \text{ V to } -1.5 \text{ V}$	Full range	10			10			V/IIIV
r _i	Input resistance		25°C		70			70		MΩ
c _i	Input capacitance		25°C		2.5			2.5		pF
Z ₀	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
CIVIDA	rejection ratio	$V_{IC} = V_{ICR}$ min, $R_S = 50 \Omega$	Full range	80			80			UD
k _{SVR}	Supply-voltage rejection ratio	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V,}$ $R_S = 50 \Omega$	25°C	90	106		90	106		dB
	$(\Delta V_{CC\pm}/\Delta V_{IO})$		Full range	85			85			
I _{CC}	Supply current	$V_O = 2.5 V$, No load,	25°C		13.2	17.6		13.2	17.6	mA
	ngo is 40°C to 105°C	V _{IC} = 2.5 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 00	NDITIONO	1	LE2144		TI	LE2144A	VI	
	PARAMETER	IESI CO	NDITIONS	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
	O-III' I'	$A_{VD} = -1$,	To 0.1%		0.16			0.16		_
t _s	Settling time	2.5-V step	To 0.01%		0.22			0.22		μs
.,		$R_S = 20 \Omega$,	f = 10 Hz		15			15		\ //
V _n	Equivalent input noise voltage	R _S = 20 Ω,	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 l	Hz		0.51			0.51		μV
	F	f = 10 Hz			1.92			1.92		A / /
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 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
φ _m	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_{CC^\pm} = $\pm 15~V$ (unless otherwise noted)

	PARAMETER	TEST COND	NITIONS	- +	Т	LE2144I		TI	E2144A	.l	
	PANAMETEN	TEST CONL	JIIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
.,				25°C		0.6	2.4		0.5	1.5	>/
V_{IO}	Input offset voltage			Full range			3.2			2.8	mV
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	
I _{IO}	Input offset current			Full range			200			200	nA
				25°C		-0.7	-1.5		-0.7	-1.5	
I _{IB}	Input bias current			Full range			-1.7			-1.7	μΑ
V	Common-mode input	D- 50 O		25°C	–15 to 13	-15.3 to 13.2		-15 to 13	-15.3 to 13.2		V
V _{ICR}	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
		$I_O = -150 \mu A$			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 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 mA		Full range	13.6			13.6			
		$I_O = -10 \text{ mA}$		=	13.1			13.1			
		I _O = 150 μA			-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		
V_{OM-}	peak output voltage swing	I _O = 100 μA			-14.6			-14.6			V
	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		
A_{VD}	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		МΩ
c _i	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 Ω	25°C	85	108		85	108		dB
	rejection ratio	10 1011		Full range	80			80			
k _{SVR}	Supply-voltage rejection ratio	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm R_S = 50 \Omega$	±15 V,	25°C Full range	90	106		90 85	106		dB
	(ΔV _{CC±} /ΔV _{IO})		V _{ID} = 1 V		-25	-50		-25	-50		
los	Short-circuit output current	V _O = 0	$\frac{V_{ID} = 1 \text{ V}}{V_{ID} = -1 \text{ V}}$	25°C	20	31		20	31		mA
			ΔID 1 Δ	25°C	20	13.8	18	20	13.8	18	
I_{CC}	Supply current	V _O = 0,	No load	-		10.0			10.0		mA
				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°C

	DADAMETED		IDITIONO	Т	LE2144I		TL	.E2144A	J	
	PARAMETER	TEST COI	NUTTIONS	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
	O-Wine Con-	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		- N//III
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 H	łz		0.48			0.48		.,
$V_{N(PP)}$	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 / /III
In	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
φ _m	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	- +	TL	E2141N	1	TL	E2141A	М	
	PARAMETER	TEST CONDITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
, , , , , , , , , , , , , , , , , , ,	land affect values		25°C		225	1400		200	1000	
V_{IO}	Input offset voltage		Full range			2100			1700	μV
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
	Inner offeet erroret	V _{IC} = 2.5 V	25°C		8	100		8	100	^
I _{IO}	Input offset current		Full range			250			250	nA
	Input high ourrent		25°C		-0.8	-2		-0.8	-2	^
I _{IB}	Input bias current		Full range			-2.3			-2.3	μА
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
VICH	voltage range	115 - 30 12	Full range	0 to 2.7	-0.3 to 2.9		0 to 2.7	-0.3 to 2.9		·
		$I_{OH} = -150 \mu A$		3.9	4.1		3.9	4.1		
		$I_{OH} = -1.5 \text{ mA}$	25°C	3.8	4		3.8	4		
V _{OH}	High-level output	$I_{OH} = -15 \text{ mA}$		3.2	3.7		3.2	3.7		V
VOH	voltage	$I_{OH} = -100 \mu A$		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
		$I_{OL} = 1.5 \mu\text{A}$	25°C		150	225		150	225	
V _{OL}	Low-level output	$I_{OL} = 15 \text{ mA}$			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	
		I _{OL} = 10 mA				1.25			1.25	V
A_{VD}	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
, (0)	voltage amplification	$V_0 = 1 \text{ V to } -1.5 \text{ V}$	Full range	5			5			,
r _i	Input resistance		25°C		70			70		МΩ
c _i	Input capacitance		25°C		2.5			2.5		pF
z _o	Open-loop output impedance	f = 1 MHz	25°C		30			30		Ω
CMBB	Common-mode	V V min P 50 0	25°C	85	118		85	118		4P
CMRR	rejection ratio	$V_{IC} = V_{ICR}$ min, $R_S = 50 \Omega$	Full range	80			80			dB
ka:=	Supply-voltage rejection	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V},$	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	-		uD
loo	Supply current	$V_O = 2.5 \text{ V}$, No load,	25°C		3.4	4.4		3.4	4.4	mA
Icc	очьый синсти	$V_{IC} = 2.5 V$	Full range			4.6			4.6	ША

[†] Full range is –55°C to 125°C.



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

				Т	LE2141N	Л	Τl	E2141A	М	
	PARAMETER	TEST CON	NDITIONS	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
	O-What Park	$A_{VD} = -1$,	To 0.1%		0.16			0.16		_
t _s	Settling time	2.5-V step	To 0.01%		0.22			0.22		μs
V	En industrial color allows	$R_S = 20 \Omega$,	f = 10 Hz		15			15		->.//
V _n	Equivalent input noise voltage	$R_S = 20 \Omega$,	f = 1 kHz		10.5			10.5		nV/√ Hz
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 l	Hz		0.51			0.51		μV
		f = 10 Hz			1.92			1.92		- 4 / /
I _n	Equivalent input noise current	f = 1 kHz			0.5			0.5		pA/√ Hz
THD + N	Total harmonic distortion plus noise	$V_{O} = 1 \text{ V to 3 V},$ $A_{VD} = 2,$	$R_L = 2 k\Omega^{\dagger}$, $f = 10 kHz$		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	$C_L = 100 \text{ pF}^{\dagger},$		5.8			5.8		MHz
B _{OM}	Maximum output-swing bandwidth	V _{O(PP)} = 2 V, A _{VD} = 1	$R_L = 2 k\Omega^{\dagger}$,		660			660		kHz
φ _m	Phase margin at unity gain	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF [†]		57°			57°		

 $^{^{\}dagger}$ R_L and C_L terminated to 2.5 V.

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

	PARAMETER	TEST CON	DITIONS	- +	Т	LE2141N	Л	TL	E2141A	М	
	PANAMETEN	TEST CON	DITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
.,	land the office to college			25°C		200	900		175	500	
V _{IO}	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
	Inner de official contract	$V_{IC} = 0$,	$R_S = 50 \Omega$	25°C		7	100		7	100	~^
I _{IO}	Input offset current			Full range			250			250	nA
١.	Innet hine accurant			25°C		-0.7	-1.5		-0.7	-1.5	^
I _{IB}	Input bias current			Full range			-1.8			-1.8	μΑ
V _{ICR}	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
VICK	voltage range	115 - 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		
		$I_0 = -1.5 \text{ mA}$		25°C	13.7	14		13.7	14		
V	Maximum positive peak	$I_O = -15 \text{ mA}$			13.1	13.7		13.1	13.7		V
V _{OM+}	output voltage swing	$I_O = -100 \mu A$			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			
		$I_O = 150 \mu\text{A}$			-14.7	-14.9		-14.7	-14.9		
		I _O = 1.5 mA		25°C	-14.5	-14.8		-14.5	-14.8		
l.,	Maximum negative peak	I _O = 15 mA			-13.4	-13.8		-13.4	-13.8		V
V_{OM-}	output voltage swing	I _O = 100 μA			-14.6			-14.6			V
		I _O = 1 mA		Full range	-14.5			-14.5			
		I _O = 10 mA			-13.4			-13.4			
	Large-signal differential		D 010	25°C	100	450		100	450		
A_{VD}	voltage amplification	$V_0 = \pm 10 \text{ V},$	$R_L = 2 k\Omega$	Full range	20			20			V/mV
r _i	Input resistance			25°C		65			65		MΩ
c _i	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	$V_{IC} = V_{ICR}min,$	$H_S = 50 \Omega$	Full range	80			80			dB
	Supply-voltage rejection	$V_{CC\pm} = \pm 2.5 \text{ V to}$	o ±15 V,	25°C	90	106		90	106		
k _{SVR}	ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$R_S = 50 \Omega$	•	Full range	85			85			dB
	Short-circuit output	., .	V _{ID} = 1 V	0=:0	-25	-50		-25	-50		_
los	current	$V_O = 0$	V _{ID} = -1 V	25°C	20	31		20	31		mA
	Ownership arrows of	V _O = 0,	No load,	25°C		3.5	4.5		3.5	4.5	A
I _{CC}	Supply current	V _{IC} = 2.5 V	,	Full range			4.7			4.7	mA

 $^{^{\}dagger}$ Full range is -55°C to 125°C.



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

	24244555	7507.001	UDITIONS	TL	.E2141N	И	TLI	E2141A	М	
	PARAMETER	TEST CO	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 = 100 pF		27	42		27	42		V/μs
	O-III F	$A_{VD} = -1$,	To 0.1%		0.34			0.34		_
t _s	Settling time	10-V step	To 0.01%		0.4			0.4		μs
V		$R_S = 20 \Omega$,	f = 10 Hz		15			15		->4/
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	łz		0.48			0.48		,,
V _{N(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 kΩ, 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
φ _m	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 V (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	T +	TL	E2142N	/	TL	E2142A	М	
	PARAMETER	TEST CONDITIONS	T _A †	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
· ·	land toffeet valtage		25°C		220	1900		200	1500	
V _{IO}	Input offset voltage		Full range			2600			2200	μV
α_{VIO}	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
	land offer at a company	V _{IC} = 2.5 V	25°C		8	100		8	100	- 0
I _{IO}	Input offset current		Full range			200			200	nA
١.	Input biog ourrent		25°C		-0.8	-2		-0.8	-2	^
I _{IB}	Input bias current		Full range			-2.3			-2.3	μΑ
	Common-mode input	$R_S = 50 \Omega$	25°C	0 to 3	-0.3 to 3.2		0 to 3	-0.3 to 3.2		V
V _{ICR}	voltage range	TNS = 50 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 μA		3.9	4.1		3.9	4.1		
		$I_{OH} = -1.5 \text{ mA}$	25°C	3.8	4		3.8	4		
l.,	High-level output	I _{OH} = – 15 mA		3.4	3.7		3.4	3.7		V
V _{OH}	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
l.,	Low-level output	I _{OL} = 15 mA			1.2	1.4		1.2	1.4	V
V_{OL}	voltage	I _{OL} = 100 μA				200			200	\/
		I _{OL} = 1 mA	Full range			250			250	mV
		I _{OL} = 10 mA				1.25			1.25	V
_	Large-signal differential	$V_{IC} = \pm 2.5 \text{ V}, \qquad R_L = 2 \text{ k}\Omega,$	25°C	50	220		50	220		\//\/
A _{VD}	voltage amplification	$V_0 = 1 \text{ V to } -1.5 \text{ V}$	Full range	5			5			V/mV
r _i	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
CMDD	Common-mode	V V min D 500	25°C	85	118		85	118		40
CMRR	rejection ratio	$V_{IC} = V_{ICR}min$, $R_S = 50 \Omega$	Full range	80			80			dB
1.	Supply-voltage rejec-	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V},$	25°C	90	106		90	106		45
k _{SVR}	tion ratio ($\Delta V_{CC\pm} / \Delta V_{IO}$)	$R_S = 50 \Omega$	Full range	85			85			dB
	Occasion access of	$V_O = 2.5 \text{ V}$, No load,	25°C		6.6	8.8		6.6	8.8	4
I _{CC}	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	TEGT 001	DITIONS		TLE2142M		Т	LE2142AN	Л	
	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
	0.000	$A_{VD} = -1$,	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		-VIII
V _n	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	Z		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 cur-	f = 10 Hz			1.92			1.92		A / /TT
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 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
Вом	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
φ _m	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_{CC^\pm} = $\pm 15~V$ (unless otherwise noted)

	PARAMETER	TEST CONDITIONS	T _A †	TLE2142M			TLE2142AM			
				MIN	TYP	MAX	MIN	TYP	MAX	UNIT
V _{IO} In	Input offset voltage		25°C		290	1200		275	750	μV
			Full range			2000			1600	
α_{VIO}	Temperature coefficient of input offset voltage		Full range		1.7			1.7		μV/°C
I _{IO}	Input offset current	$V_{IC} = 0,$ $R_S = 50 \Omega$	25°C		7	100		7	100	nA
			Full range			250			250	
	logest bigg growns		25°C		-0.7	-1.5		-0.7	-1.5	
I _{IB}	Input bias current		Full range			-1.8			-1.8	μΑ
V _{ICR}	Common-mode input voltage range	$R_S = 50 \Omega$	25°C	-15 to 13	-15.3 to 13.2		-15 to 13	-15.3 to 13.2		· v
			Full range	-15 to 12.7	-15.3 to 12.9		-15 to 12.7	-15.3 to 12.9		
V _{OM+}	Maximum positive peak output voltage swing	$I_{O} = -150 \mu\text{A}$		13.8	14.1		13.8	14.1		
		$I_0 = -1.5 \text{ mA}$	25°C	13.7	14		13.7	14		
		I _O = –15 mA		13.3	13.7		13.3	13.7		
		$I_{O} = -100 \mu\text{A}$		13.7			13.7			
		$I_0 = -1 \text{ mA}$	Full range	13.6			13.6			
		I _O = –10 mA		13.3			13.3			
V _{OM} _	Maximum negative peak output voltage swing	I _O = 150 μA		-14.7	-14.9		-14.7	-14.9		
		I _O = 1.5 mA	25°C	-14.5	-14.8		-14.5	-14.8		
		I _O = 15 mA		-13.4	-13.8		-13.4	-13.8		
		I _O = 100 μA		-14.6			-14.6			
		I _O = 1 mA	Full range	-14.5			-14.5			
		I _O = 10 mA		-13.4			-13.4			
A _{VD}	Large-signal differential voltage amplification	$V_O = \pm 10 \text{ V}, R_L = 2 \text{ k}\Omega$	25°C	100	450		100	450		V/mV
			Full range	20			20			
r _i	Input resistance		25°C		65			65		МΩ
c _i	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 rejection ratio	$V_{IC} = V_{ICR}$ min, $R_S = 50 \Omega$	25°C	85	108		85	108		dB
			Full range	80			80			
k _{SVR}	Supply-voltage rejection ratio ($\Delta V_{CC} \pm /\Delta V_{IO}$)	$V_{CC\pm}$ = ±2.5 V to ±15 V, R _S = 50 Ω	25°C	90	106		90	106		dB
			Full range	85			85			
I _{OS}	Short-circuit output current	$V_O = 0$ $V_{ID} = 1 V$ $V_{ID} = -1 V$	25°C	-25	-50		-25	-50		mA
				20	31		20	31		
I _{CC}	Supply current	V_O = 0, No load, V_{IC} = 2.5 V	25°C		6.9	9		6.9	9	mA
			Full range			9.4			9.4	

[†] Full range is –55°C to 125°C.



TLE214x, TLE214xA EXCALIBUR LOW-NOISE HIGH-SPEED PRECISION OPERATIONAL AMPLIFIERS SLOS183D - FEBRUARY 1997 - REVISED OCTOBER 2012

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

	DADAMETED		IDITIONS	TI	_E2142N	1	TL	E2142AI	М	
	PARAMETER	TEST CON	NDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$R_L = 2 k\Omega$,	$A_{VD} = -1$,	27	45		27	45		\// -
SR-	Negative slew rate	C _L = 100 pF		27	42		27	42		V/μs
	0.1111	$A_{VD} = -1$,	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		\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
V _n	Equivalent input noise voltage	R _S = 20 Ω,	f = 1 kHz		10.5			10.5		nV/√ Hz
	Peak-to-peak equivalent input	f = 0.1 Hz to 1 H	łz		0.48			0.48		.,
$V_{N(PP)}$	noise voltage	f = 0.1 Hz to 10	Hz		0.51			0.51		μV
		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
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
φ _m	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 SLOS183D - FEBRUARY 1997 - REVISED OCTOBER 2012

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

	PARAMETER	TEST CONDITIONS	T _A †	TL	E2144N	Λ	TL	E2144A	М	UNIT
	PANAWIETEN	TEST CONDITIONS	ıA.	MIN	TYP	MAX	MIN	TYP	MAX	UNII
l.,	Innut offeet velters		25°C		0.5	3.8		0.5	3	mV
V _{IO}	Input offset voltage		Full range			5.2			4.4	IIIV
α_{VIO}	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
	land offert coment	V _{IC} = 2.5 V	25°C		8	100		8	100	- 4
I _{IO}	Input offset current		Full range			250			250	nA
ĺ.	land bing a mont		25°C		-0.8	-2		-0.8	-2	
I _{IB}	Input bias current		Full range			-2.3			-2.3	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		>
VICR	voltage range		Full range	0 to 2.7	-0.3 to 2.9		0 to 2.7	-0.3 to 2.9		V
		$I_{OH} = -150 \mu\text{A}$		3.9	4.1		3.9	4.1		
		$I_{OH} = -1.5 \text{ mA}$	25°C	3.8	4		3.8	4		
V _{OH}	High-level output	I _{OH} = –15 mA		3.4	3.7		3.4	3.7		V
V OH	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
		$I_{OL} = 1.5 \mu\text{A}$	25°C		150	225		150	225	IIIV
V _{OL}	Low-level output	I _{OL} = 15 mA			1.2	1.6		1.2	1.6	V
VOL	voltage	I_{OL} = 100 μ A				200			200	mV
		I _{OL} = 1 mA	Full range			250			250	IIIV
		I _{OL} = 10 mA				1.45			1.45	V
_	Large-signal differential	$V_{IC} = \pm 2.5 \text{ V}, \qquad R_L = 2 \text{ k}\Omega,$	25°C	50	95		50	95		\//m\/
A _{VD}	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		$M\Omega$
c _i	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 V min D 50.0	25°C	85	118		85	118		40
CIVINK	rejection ratio	$V_{IC} = V_{ICR}$ min, $R_S = 50 \Omega$	Full range	80			80			dB
k _{SVR}	Supply-voltage rejection ratio	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V},$ $R_S = 50 \Omega$	25°C	90	106		90	106		dB
	$(\Delta V_{CC\pm}/\Delta V_{IO})$	11g = 50 sz	Full range	85			85			
I _{CC}	Supply current	$V_O = 2.5 V$, No load,	25°C		13.2	17.6		13.2	17.6	mA
.00	ego in 55°C to 125°C	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	TEST COL	NDITIONS	TI	_E2144N	1	TLI	E2144A	M	LINUT
	PARAMETER	IEST COI	NDITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$A_{VD} = -1$,	$R_L = 2 k\Omega^{\dagger}$,		45			45		N // -
SR-	Negative slew rate	C _L = 500 pF	,		42			42		V/μs
	O-Wine 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
.,		$R_S = 20 \Omega$,	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:	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			1.92			1.92		A / / I I
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 kHz	0.0	0052%		0.0	052%		
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
φ _m	Phase margin	$R_L = 2 k\Omega^{\dagger}$,	C _L = 100 pF		57°			57°		

[†] R_L terminates at 2.5 V

TLE214x, TLE214xA EXCALIBUR LOW-NOISE HIGH-SPEED PRECISION OPERATIONAL AMPLIFIERS SLOS183D - FEBRUARY 1997 - REVISED OCTOBER 2012

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

	PARAMETER	TEST CON	DITIONS	T _A †	Т	LE2144N	1	TL	.E2144A	М	LINUT
	PANAMETEN	TEST CON	OHIONS	'A'	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
V	land affect calls as			25°C		0.6	2.4		0.5	1.5	mV
V _{IO}	Input offset voltage			Full range			4			3.2	mv
α_{VIO}	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	
I _{IO}	Input offset current			Full range			250			250	nA
				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		
V_{ICR}	voltage range	$R_S = 50 \Omega$			-15	-15.3		-15	-15.3		V
	3 3			Full range	to 12.7	to 12.9		to 12.7	to 12.9		
		I _O = – 150 μA			13.8	14.1		13.8	14.1		
		I _O = –1.5 mA		25°C	13.7	14		13.7	14		
	Maximum positive peak	I _O = – 15 mA		1	13.1	13.7		13.1	13.7		
V_{OM+}	output voltage swing	I _O = –100 μA			13.7			13.7			V
		I _O = -1 mA		Full range	13.6			13.6			
		I _O = – 10 mA		1	13.1			13.1			
		I _O = 150 μA			-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		1	-13.4	-13.8		-13.4	-13.8		
V_{OM-}	peak output voltage swing	I _O = 100 μA			-14.6			-14.6			
	Swilly	I _O = 1 mA		Full range	-14.5			-14.5			
		I _O = 10 mA		1	-13.4			-13.4			
	Large-signal differential			25°C	100	170		100	170		
A_{VD}	voltage amplification	$V_0 = \pm 10 \text{ V},$	$R_L = 2 k\Omega$	Full range	20			20			V/mV
r _i	Input resistance			25°C		65			65		ΜΩ
c _i	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
k _{SVR}	Supply-voltage rejection ratio	$V_{CC\pm} = \pm 2.5 \text{ V to}$	o ±15 V,	25°C	90	106		90	106		dB
O V I I	$(\Delta V_{CC\pm}/\Delta V_{IO})$	$R_S = 50 \Omega$		Full range	85			85			
	Short-circuit output	V 0	V _{ID} = 1 V	0500	-25	-50		-25	-50		^
los	current	V _O = 0	$V_{ID} = -1 V$	25°C	20	31		20	31		mA
	0	V _O = 0,	No load,	25°C		13.8	18		13.8	18	
I _{CC}	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 SLOS183D - FEBRUARY 1997 - REVISED OCTOBER 2012

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

	24244555	7507.001	DITIONS	Т	LE2144N	Л	TL	.E2144Al	М	
	PARAMETER	TEST CON	DITIONS	MIN	TYP	MAX	MIN	TYP	MAX	UNIT
SR+	Positive slew rate	$R_L = 2 k\Omega$	$A_{VD} = -1$,	27	45		27	45		.,,
SR-	Negative slew rate	C _L = 100 pF		27	42		27	42		V/μs
	O. III's a 1's a	$A_{VD} = -1$,	To 0.1%		0.34			0.34		_
t _s	Settling time	10-V step	To 0.01%		.4			.4		μs
v	Establish to the disconnection	$R_S = 20 \Omega$,	f = 10 Hz		15			15		->4/ U
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		.,
$V_{N(PP)}$	noise voltage	f = 0.1 Hz to 10 H	z		0.51			0.51		μV
		f = 10 Hz			1.89			1.89		A / /II
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 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
φ _m	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 SLOS183D - FEBRUARY 1997 - REVISED OCTOBER 2012

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

	DADAMETED	TEST CON	IDITIONS	Т	LE2141Y	•	
	PARAMETER	TEST CON	DITIONS	MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage	_			200	1000	μV
I _{IO}	Input offset current	$V_{IC} = 0, V_{O} = 0$	$R_S = 50 \Omega$,		7	100	nA
I_{IB}	Input bias current	V 0 = V			-0.7	-1.5	μΑ
V _{ICR}	Common-mode input voltage range	$R_S = 50 \Omega$		-15 to 13	-15.3 to 13.2		٧
		$I_O = -150 \mu A$		13.8	14.1		
V _{OM+}	Maximum positive peak output voltage swing	$I_0 = -1.5 \text{ mA}$		13.7	14		V
		$I_{O} = -15 \text{ mA}$		13.3	13.7		
		I _O = 150 μA		-14.7	-14.9		
V _{OM} –	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
r _i	Input resistance				65		ΜΩ
c _i	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
k _{SVR}	Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$V_{CC\pm}$ = ±2.5 V to R_S = 50 Ω	±15 V,	85	106		dB
	Object size it autout a conset	., .	V _{ID} = 1 V	-25	-50		^
los	Short-circuit output current	V _O = 0	$V_{ID} = -1 V$	20	31		mA
I _{CC}	Supply current	$V_O = 0$,	No load		3.5	4.5	mA

TLE214x, TLE214xA EXCALIBUR LOW-NOISE HIGH-SPEED PRECISION OPERATIONAL AMPLIFIERS SLOS183D - FEBRUARY 1997 - REVISED OCTOBER 2012

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

	DADAMETED	oo	NDITIONS.	Т	LE2142\	1	
	PARAMETER	IESI CO	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	V O = 0			-0.7	-1.5	μΑ
V _{ICR}	Common-mode input voltage range	$R_S = 50 \Omega$		-15 to 13	-15.3 to 13.2		٧
		$I_O = -150 \mu A$		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		
		$I_{O} = 150 \mu A$		-14.7	-14.9		
V_{OM-}	Maximum negative peak output voltage swing	$I_{O} = 1.5 \text{ mA}$		-14.5	-14.8		V
		I _O = 15 mA		-13.4	-13.8		
A_{VD}	Large-signal differential voltage amplification	$V_{O} = \pm 10 \text{ V},$	$R_L = 2 k\Omega$	100	450		V/mV
rį	Input resistance				65		МΩ
c _i	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
k _{SVR}	Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$V_{CC\pm} = \pm 2.5 \text{ V t}$ $R_S = 50 \Omega$	o ±15 V,	85	106		dB
	Short aircuit autaut aurrent	V 0	V _{ID} = 1 V	-25	-50	·	mA
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 SLOS183D - FEBRUARY 1997 - REVISED OCTOBER 2012

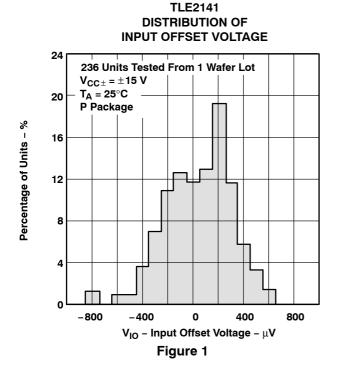
TLE2144Y electrical characteristics at V_{CC^\pm} = ± 15 V, T_A = 25°C (unless otherwise noted)

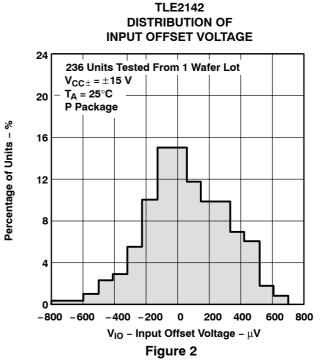
	DADAMETED	TEST SOUDITI	ono.	Т	LE2144Y		
	PARAMETER	TEST CONDITI	ONS	MIN	TYP	MAX	UNIT
V _{IO}	Input offset voltage				0.3	1.8	mV
I _{IO}	Input offset current	$V_{IC} = 0, V_{O} = 0$	$R_S = 50 \Omega$,		7	100	nA
I _{IB}	Input bias current				-0.7	-1.5	μА
V _{ICR}	Common-mode input voltage range	$R_S = 50 \Omega$		-15 to 13	-15.3 to 13.2		٧
		I _O = -150 μA		13.8	14.1		
V _{OM+}	Maximum positive peak output voltage swing	I _O = -1.5 mA		13.7	14		V
		I _O = -15 mA		13.3	13.7		
		I _O = 150 μA		-14.7	-14.9		
V_{OM-}	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
r _i	Input resistance				65		$M\Omega$
c _i	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
k _{SVR}	Supply-voltage rejection ratio ($\Delta V_{CC\pm}/\Delta V_{IO}$)	$V_{CC\pm} = \pm 2.5 \text{ V to } \pm 15 \text{ V},$	$R_S = 50 \Omega$	85	106		dB
los	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		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
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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
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	Pulse response	Inverting large signal	vs Time	32
	·	Small signal	vs Time	33
B ₁	Unity-gain bandwidth	1	vs Load capacitance	34
	Gain margin		vs Load capacitance	35
φ _m	Phase margin		vs Load capacitance	36
	Phase shift		vs Frequency	15







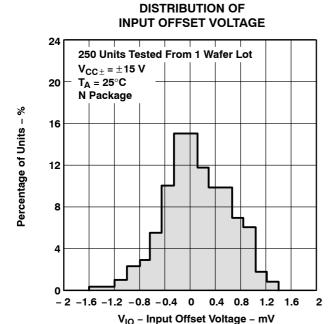
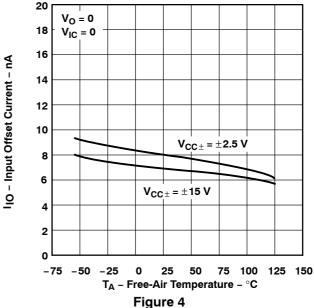


Figure 3

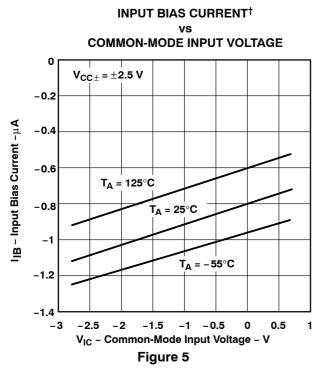
TLE2144



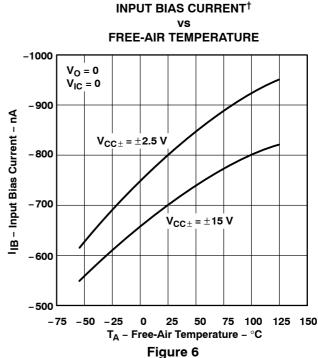


[†] Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.





MAXIMUM PEAK OUTPUT VOLTAGE



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 V_{OM}--12 -18 - 24 0 3 12 15 18 21 24

 $V_{CC\pm}$ – Supply Voltage – V

Figure 7

15 $V_{CC\pm}=\pm15~V$ 14.6 $R_L=\infty$ 14.2 V_{OM+} 13.8 $R_L=2~k\Omega$ $-14.2 R_L=2~k\Omega$ $R_L=2~k\Omega$ $R_L=2~k\Omega$

0

25

Figure 8

 T_A – Free-Air Temperature – $^{\circ}C$

50

75 100 125 150

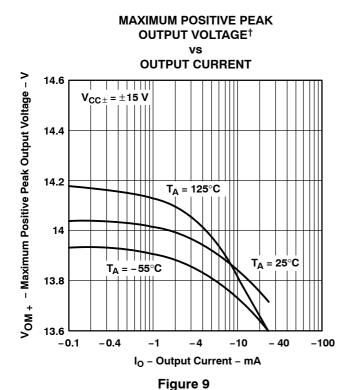
MAXIMUM PEAK OUTPUT VOLTAGE

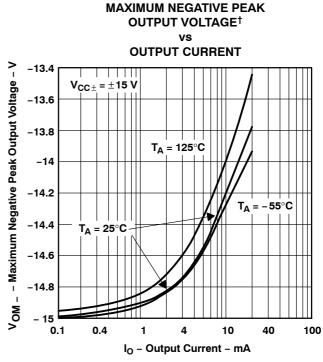
FREE-AIR TEMPERATURE

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

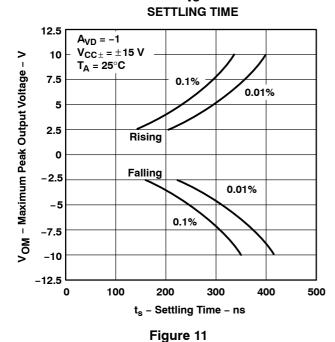
-15

-75 -50 -25



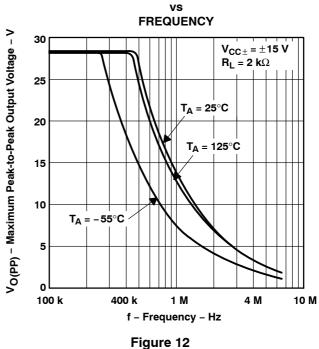


MAXIMUM PEAK OUTPUT VOLTAGE VS



MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE[†]

Figure 10

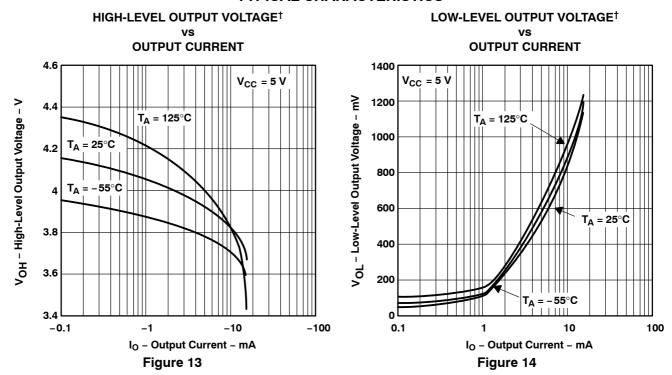


[†] Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.



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TYPICAL CHARACTERISTICS



LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION AND PHASE SHIFT

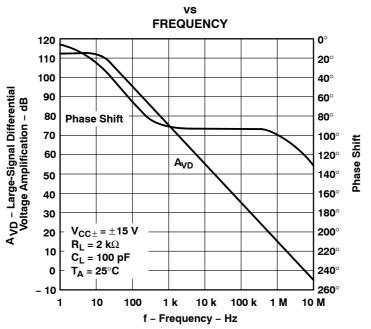


Figure 15

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

Figure 16

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

Figure 17

SHORT-CIRCUIT OUTPUT CURRENT†

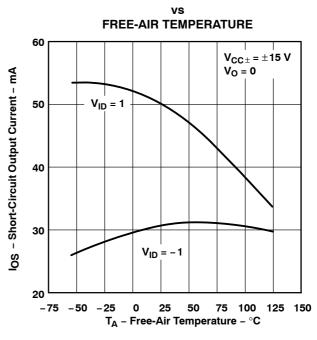


Figure 18

 $^{^\}dagger$ 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 0 100 1 k 10 k 100 k 1 M f - Frequency - Hz

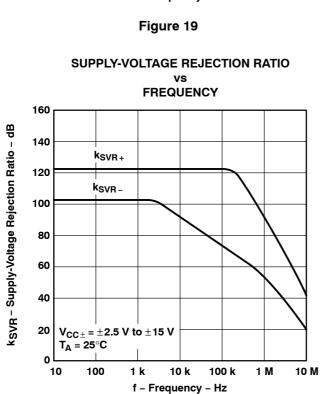


Figure 21

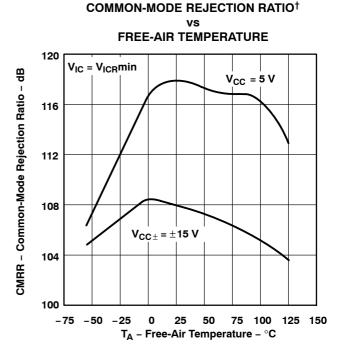
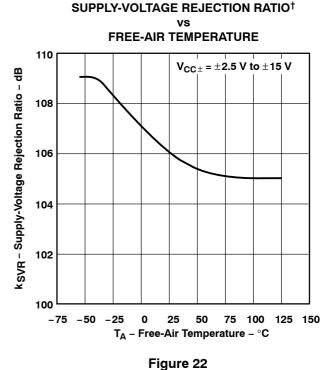
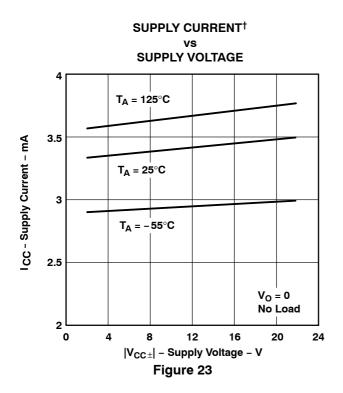


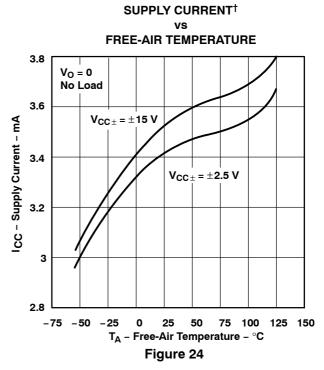
Figure 20



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





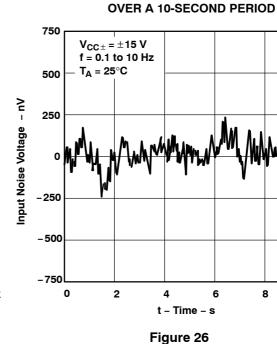


INPUT NOISE VOLTAGE

8

10

EQUIVALENT INPUT NOISE VOLTAGE[†] vs **FREQUENCY** 250 $R_S = 20\Omega$ 200



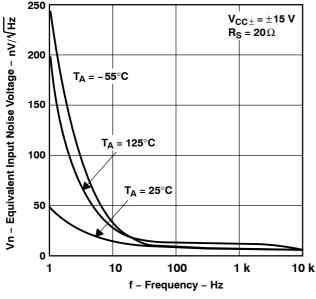
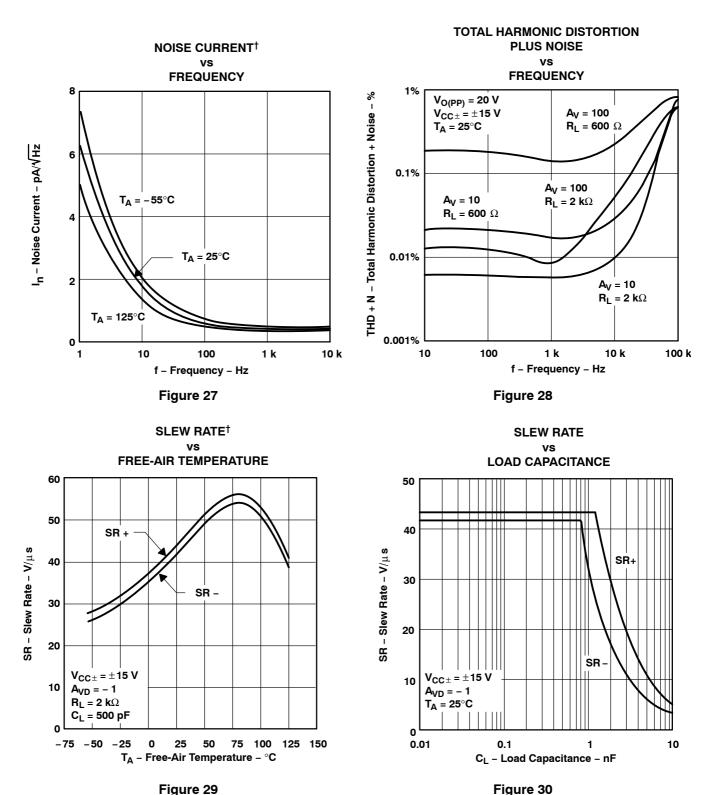


Figure 25

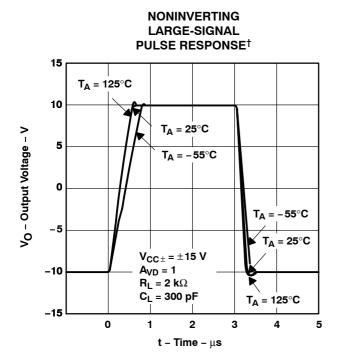
[†] Data at high and low temperatures are applicable only within the rated operating free-air temperature ranges of the various devices.





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





LARGE-SIGNAL **PULSE RESPONSE**† 15 $T_A = 25^{\circ}C$ 10 $T_A = -55^{\circ}C$ Vo - Output Voltage - V T_A = 125°C 5 $T_A = -55^{\circ}C$ 0 TA = 125°C T_A = 25°C -5 $V_{CC\pm}$ = $\pm 15 V$ -10 $A_{VD} = -1$ $R_L = 2 k\Omega$ $C_{L} = 300 pF$ -15 0 1 2 3 4 5 t – Time – μ s

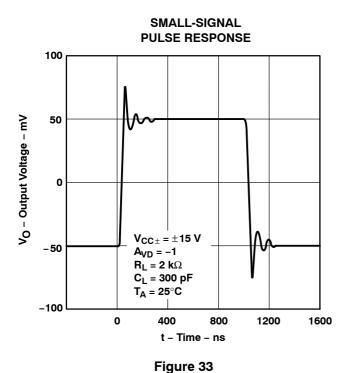
INVERTING

Figure 31

Figure 32

UNITY-GAIN BANDWIDTH†

vs



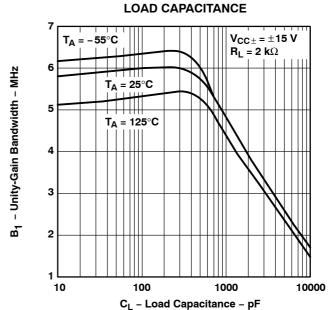


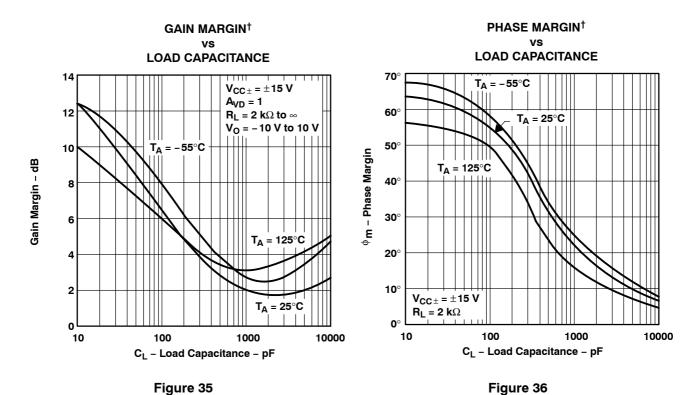
Figure 34

[†] 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



 $^{^\}dagger$ 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.

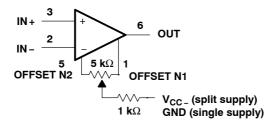


Figure 37. Input Offset Voltage Null Circuit







10-Jun-2014

PACKAGING INFORMATION

Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead/Ball Finish (6)	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
5962-9321603Q2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9321603Q2A TLE2142MFKB	Samples
5962-9321603QHA	ACTIVE	CFP	U	10	1	TBD	A42	N / A for Pkg Type	-55 to 125	9321603QHA TLE2142M	Samples
5962-9321603QPA	ACTIVE	CDIP	JG	8	1	TBD	A42	N / A for Pkg Type	-55 to 125	9321603QPA TLE2142M	Samples
5962-9321604Q2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9321604Q2A TLE2142 AMFKB	Samples
5962-9321604QHA	ACTIVE	CFP	U	10	1	TBD	A42	N / A for Pkg Type	-55 to 125	9321604QHA TLE2142AM	Samples
5962-9321604QPA	ACTIVE	CDIP	JG	8	1	TBD	A42	N / A for Pkg Type	-55 to 125	9321604QPA TLE2142AM	Samples
5962-9321605Q2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9321605Q2A TLE2144MFKB	Samples
5962-9321605QCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9321605QC A TLE2144MJB	Samples
5962-9321606Q2A	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9321606Q2A TLE2144 AMFKB	Samples
5962-9321606QCA	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9321606QC A TLE2144AMJB	Samples
TLE2141ACD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2141AC	Samples
TLE2141ACDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2141AC	Samples
TLE2141ACP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2141AC	Samples



Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
TLE2141ACPE4	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2141AC	Samples
TLE2141AID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2141AI	Samples
TLE2141AIDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2141AI	Samples
TLE2141AIDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2141AI	Samples
TLE2141AIDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2141AI	Samples
TLE2141AIP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type	0 to 70	TLE2141AI	Samples
TLE2141CD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2141C	Samples
TLE2141CDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2141C	Samples
TLE2141CDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2141C	Samples
TLE2141CDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2141C	Samples
TLE2141CP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2141CP	Samples
TLE2141CPE4	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2141CP	Samples
TLE2141ID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		21411	Samples
TLE2141IDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		21411	Samples
TLE2141IDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		21411	Samples
TLE2141IDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		21411	Samples
TLE2141IP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2141IP	Samples
TLE2141IPE4	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2141IP	Samples



Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
TLE2141MD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	2141M	Samples
TLE2141MDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	2141M	Samples
TLE2142ACD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2142AC	Samples
TLE2142ACDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2142AC	Samples
TLE2142ACDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2142AC	Samples
TLE2142ACDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2142AC	Samples
TLE2142ACP	OBSOLETE	PDIP	Р	8		TBD	Call TI	Call TI	0 to 70		
TLE2142AID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2142AI	Samples
TLE2142AIDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2142AI	Samples
TLE2142AIDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2142AI	Samples
TLE2142AIDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2142AI	Samples
TLE2142AIP	OBSOLETE	PDIP	Р	8		TBD	Call TI	Call TI			
TLE2142AMD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	E2142A	Samples
TLE2142AMDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		E2142A	Samples
TLE2142AMDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	E2142A	Samples
TLE2142AMDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		E2142A	Samples
TLE2142AMFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9321604Q2A TLE2142 AMFKB	Samples
TLE2142AMJG	ACTIVE	CDIP	JG	8	1	TBD	A42	N / A for Pkg Type		TLE2142AMJG	Samples





Orderable Device	Status	Package Type		Pins	_	Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking	Samples
	(1)		Drawing		Qty	(2)	(6)	(3)		(4/5)	
TLE2142AMJGB	ACTIVE	CDIP	JG	8	1	TBD	A42	N / A for Pkg Type	-55 to 125	9321604QPA TLE2142AM	Samples
TLE2142AMUB	ACTIVE	CFP	U	10	1	TBD	A42	N / A for Pkg Type	-55 to 125	9321604QHA TLE2142AM	Samples
TLE2142CD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2142C	Samples
TLE2142CDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2142C	Samples
TLE2142CDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2142C	Samples
TLE2142CDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2142C	Samples
TLE2142CP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2142CP	Samples
TLE2142CPE4	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2142CP	Samples
TLE2142CPWLE	OBSOLETE	TSSOP	PW	16		TBD	Call TI	Call TI			
TLE2142CPWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		Q2142	Samples
TLE2142ID	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		21421	Samples
TLE2142IDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		21421	Samples
TLE2142IDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		21421	Samples
TLE2142IDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		21421	Samples
TLE2142IP	ACTIVE	PDIP	Р	8	50	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2142IP	Samples
TLE2142MD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	2142M	Samples
TLE2142MDG4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2142M	Samples
TLE2142MDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	2142M	Samples



Orderable Device	Status	Package Type		Pins		Eco Plan	Lead/Ball Finish	MSL Peak Temp	Op Temp (°C)	Device Marking	Samples
	(1)		Drawing		Qty	(2)	(6)	(3)		(4/5)	
TLE2142MDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		2142M	Samples
TLE2142MFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9321603Q2A TLE2142MFKB	Samples
TLE2142MJGB	ACTIVE	CDIP	JG	8	1	TBD	A42	N / A for Pkg Type	-55 to 125	9321603QPA TLE2142M	Samples
TLE2142MUB	ACTIVE	CFP	U	10	1	TBD	A42	N / A for Pkg Type	-55 to 125	9321603QHA TLE2142M	Samples
TLE2144ACN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2144ACN	Samples
TLE2144AIN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2144AIN	Samples
TLE2144AINE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2144AIN	Samples
TLE2144AMFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9321606Q2A TLE2144 AMFKB	Samples
TLE2144AMJB	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9321606QC A TLE2144AMJB	Samples
TLE2144CDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		TLE2144C	Samples
TLE2144CDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		TLE2144C	Samples
TLE2144CDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		TLE2144C	Samples
TLE2144CDWRG4	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		TLE2144C	Samples
TLE2144CN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2144CN	Samples
TLE2144CNE4	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2144CN	Samples
TLE2144IDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		TLE2144I	Samples



PACKAGE OPTION ADDENDUM



10-Jun-2014

Orderable Device	Status	Package Type	Package Drawing	Pins	Package Qty	Eco Plan	Lead/Ball Finish (6)	MSL Peak Temp	Op Temp (°C)	Device Marking (4/5)	Samples
TLE2144IDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		TLE2144I	Samples
TLE2144IDWR	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		TLE2144I	Samples
TLE2144IDWRG4	ACTIVE	SOIC	DW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		TLE2144I	Samples
TLE2144IN	ACTIVE	PDIP	N	14	25	Pb-Free (RoHS)	CU NIPDAU	N / A for Pkg Type		TLE2144IN	Samples
TLE2144MDW	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM	-55 to 125	TLE2144M	Samples
TLE2144MDWG4	ACTIVE	SOIC	DW	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM		TLE2144M	Samples
TLE2144MFKB	ACTIVE	LCCC	FK	20	1	TBD	POST-PLATE	N / A for Pkg Type	-55 to 125	5962- 9321605Q2A TLE2144MFKB	Samples
TLE2144MJB	ACTIVE	CDIP	J	14	1	TBD	A42	N / A for Pkg Type	-55 to 125	5962-9321605QC A TLE2144MJB	Samples
TLE2144MN	OBSOLETE	PDIP	N	14		TBD	Call TI	Call TI	-55 to 125		

⁽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.

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)

⁽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.

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

PACKAGE OPTION ADDENDUM



10-Jun-2014

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

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OTHER QUALIFIED VERSIONS OF TLE2141, TLE2141A, TLE2142A, TLE2142A, TLE2142AM, TLE2142M, TLE2144A, TLE2144AM, TLE2144AM, TLE2144AM.

- Catalog: TLE2142A, TLE2142, TLE2144A, TLE2144
- Automotive: TLE2141-Q1, TLE2142-Q1, TLE2142-Q1
- Enhanced Product: TLE2141-EP, TLE2144-EP, TLE2144-EP
- Military: TLE2141M, TLE2141AM, TLE2142M, TLE2142AM, TLE2144AM, TLE2144AM

NOTE: Qualified Version Definitions:

- Catalog TI's standard catalog product
- Automotive Q100 devices qualified for high-reliability automotive applications targeting zero defects
- Enhanced Product Supports Defense, Aerospace and Medical Applications
- Military QML certified for Military and Defense Applications

PACKAGE MATERIALS INFORMATION

www.ti.com 14-Mar-2013

TAPE AND REEL INFORMATION



TAPE DIMENSIONS KO P1 BO W Cavity A0

	Dimension designed to accommodate the component width
	Dimension designed to accommodate the component length
	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
TLE2141MDR	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
TLE2142AMDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2142AMDRG4	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	6.9	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
TLE2142MDR	SOIC	D	8	2500	330.0	12.4	6.4	5.2	2.1	8.0	12.0	Q1
TLE2142MDRG4	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

PACKAGE MATERIALS INFORMATION

www.ti.com 14-Mar-2013



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TLE2141AIDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2141CDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2141IDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2141MDR	SOIC	D	8	2500	367.0	367.0	35.0
TLE2142ACDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2142AIDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2142AMDR	SOIC	D	8	2500	367.0	367.0	35.0
TLE2142AMDRG4	SOIC	D	8	2500	367.0	367.0	35.0
TLE2142CDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2142CPWR	TSSOP	PW	16	2000	367.0	367.0	35.0
TLE2142IDR	SOIC	D	8	2500	340.5	338.1	20.6
TLE2142MDR	SOIC	D	8	2500	367.0	367.0	35.0
TLE2142MDRG4	SOIC	D	8	2500	367.0	367.0	35.0
TLE2144CDWR	SOIC	DW	16	2000	367.0	367.0	38.0
TLE2144IDWR	SOIC	DW	16	2000	367.0	367.0	38.0

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

14 LEADS SHOWN



- 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.

U (S-GDFP-F10)

CERAMIC DUAL FLATPACK



- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. This package can be hermetically sealed with a ceramic lid using glass frit.
- D. Index point is provided on cap for terminal identification only.
- E. Falls within MIL STD 1835 GDFP1-F10 and JEDEC MO-092AA



FK (S-CQCC-N**)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



- 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. Falls within JEDEC MS-004



P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE PACKAGE



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



PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M—1994.
- B. This drawing is subject to change without notice.
- Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
- Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
- E. Falls within JEDEC MO-153



PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



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



D (R-PDSO-G8)

PLASTIC SMALL OUTLINE



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



D (R-PDSO-G8)

PLASTIC SMALL OUTLINE



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



DW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



NOTES: A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.

- 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.



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