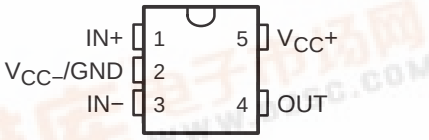
SINGLE LOW-POWER OPERATIONAL AMPLIFIER

SLOS250G − JUNE 1999 − REVISED JANUARY 2005

- **Wide Range of Supply Voltages, Single Supply 3 V to 30 V, or Dual Supplies**
- **Class AB Output Stage**
- **True Differential-Input Stage**
- **Low Input Bias Current**
- **Internal Frequency Compensation**
- **Short-Circuit Protection**

DBV PACKAGE
(TOP VIEW)



description/ordering information

The TL343 is a single operational amplifier similar in performance to the μA741, but with several distinct advantages. It is designed to operate from a single supply over a range of voltages from 3 V to 30 V. Operation from split supplies also is possible, provided the difference between the two supplies is 3 V to 30 V. The common-mode input range includes the negative supply. Output range is from the negative supply to V_{CC} − 1.5 V.

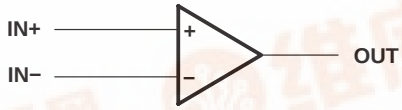
ORDERING INFORMATION

T_A	V_{IO}MAX AT 25°C	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING‡
−40°C to 125°C	10 mV	SOT-23-5 (DBV)	Reel of 3000	TL343IDBVR	T4I_
			Reel of 250	TL343IDBVT	

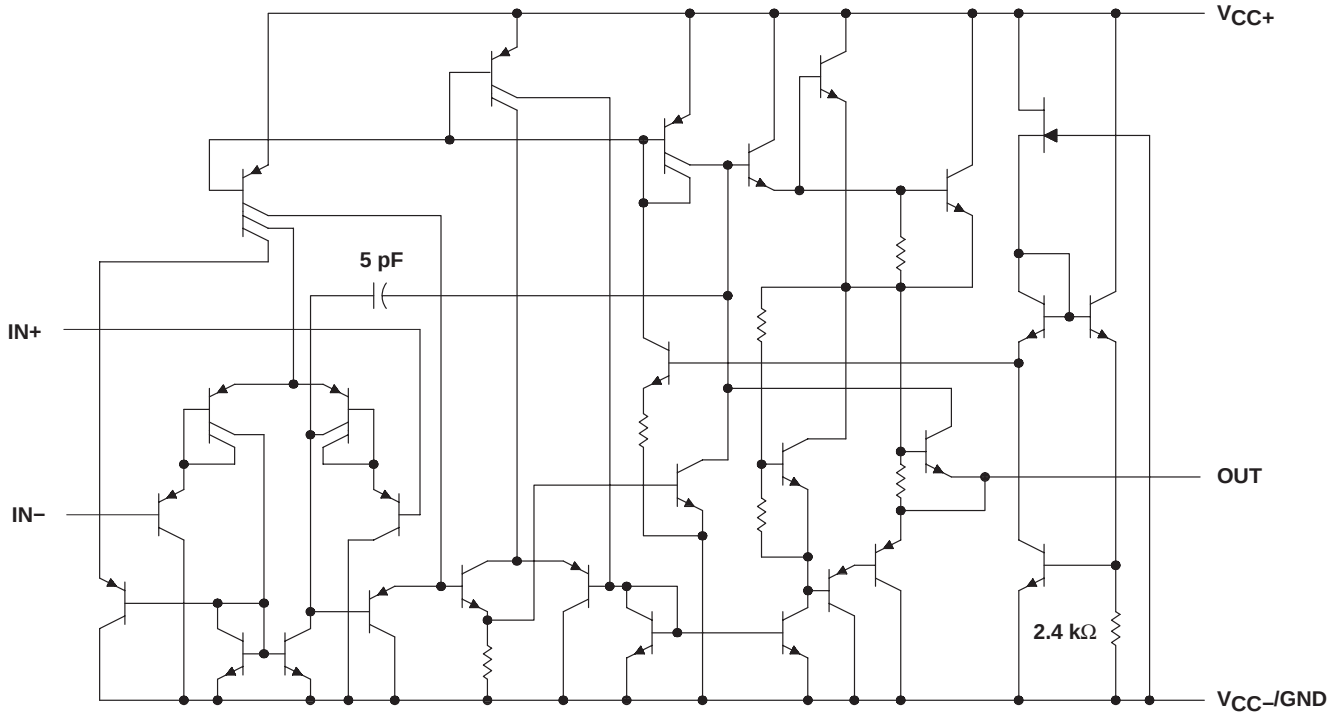
† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

‡ The actual top-side marking has one additional character that designates the assembly/test site.

symbol



schematic



NOTE A: Component values shown are nominal.

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

		MAX	UNIT
Supply voltage (see Note 1)	V_{CC+}	18	V
	V_{CC-}	−18	
Supply voltage, V_{CC+} with respect to V_{CC-}		36	V
Differential input voltage (see Note 2)		±36	V
Input voltage (see Notes 1 and 3)		±18	V
Package thermal impedance, θ_{JA} (see Notes 4 and 5)		206	°C/W
Operating virtual junction temperature, T_J		150	°C
Storage temperature range, T_{stg}		−65 to 150	°C

NOTES: 1. These voltage values are with respect to the midpoint between V_{CC+} and V_{CC-}.
2. Differential voltages are at IN+ with respect to IN−.
3. Neither input must ever be more positive than V_{CC+} or more negative than V_{CC-}.
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 $P_D = (T_J(max) - T_A)/\theta_{JA}$. Selecting the maximum of 150°C can affect reliability.
5. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions

		MIN	MAX	UNIT
V_{CC}	Single-supply voltage	3	30	V
V_{CC+}	Dual-supply voltage	1.5	15	V
V_{CC-}		−1.5	−15	
T_A	Operating free-air temperature	−40	125	°C

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

PARAMETER		TEST CONDITIONS†			MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage	See Note 6		25°C		2	10	mV
				Full range			12	
$\alpha_{V_{IO}}$	Temperature coefficient of input offset voltage	See Note 6		Full range		10		µV/°C
I_{IO}	Input offset current	See Note 6		25°C		30	50	nA
				Full range			200	
$\alpha_{I_{IO}}$	Temperature coefficient of input offset current	See Note 6		Full range		50		pA/°C
I_{IB}	Input bias current	See Note 6		25°C		−200	−500	nA
				Full range			−800	
V_{ICR}	Common-mode input voltage range‡			25°C	V_{CC-} to 13	V_{CC-} to 13.5		V
V_{OM}	Peak output-voltage swing	R_L = 10 kΩ		25°C	±12	±13.5		V
		R_L = 2 kΩ		25°C	±10	±13		
				Full range	±10			
A_{VD}	Large-signal differential voltage amplification	V_O = ±10 V,	R_L = 2 kΩ	25°C	20	200		V/mV
				Full range	15			
B_{OM}	Maximum-output-swing bandwidth	V_{OPP} = 20 V, THD ≤ 5%,	A_{VD} = 1, R_L = 2 kΩ	25°C		9		kHz
B_1	Unity-gain bandwidth	V_O = 50 mV,	R_L = 10 kΩ	25°C		1		MHz
ϕ_m	Phase margin	C_L = 200 pF,	R_L = 2 kΩ	25°C		44		Deg
r_i	Input resistance	f = 20 Hz		25°C	0.3	1		MΩ
r_o	Output resistance	f = 20 Hz		25°C		75		Ω
CMRR	Common-mode rejection ratio	V_{IC} = V_{ICR}(min)		25°C	70	90		dB
k_{SVS}	Supply-voltage sensitivity ($\Delta V_{IO}/\Delta V_{CC}$)	$V_{CC\pm}$ = ±2.5 to ±15 V		25°C		30	150	µV/V
I_{OS}	Short-circuit output current§			25°C	±10	±30	±55	mA
I_{CC}	Total supply current	No load,	See Note 6	25°C		0.7	2.8	mA

† All characteristics are measured under open-loop conditions, with zero common-mode voltage, unless otherwise specified. Full range for T_A is −40°C to 125°C.

‡ The V_{ICR} limits are linked directly, volt-for-volt, to supply voltage; the positive limit is 2 V less than V_{CC+}.

§ Temperature and/or supply voltages must be limited to ensure that the dissipation rating is not exceeded.

NOTE 6: V_{IO}, I_{IO}, I_{IB}, and I_{CC} are defined at V_O = 0.

electrical characteristics, V_{CC+} = 3 V and 5 V, V_{CC-} = 0 V, T_A = 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS†		MIN	TYP	MAX	UNIT
V_{IO}	Input offset voltage	V_O = 1.5 V and 2.5 V			2	10	mV
I_{IO}	Input offset current	V_O = 1.5 V and 2.5 V			30	50	nA
I_{IB}	Input bias current	V_O = 1.5 V and 2.5 V			−200	−500	nA
V_{OM}	Peak output voltage swing‡	R_L = 10 kΩ		3.3	3.5		V
A_{VD}	Large-signal differential voltage amplification	V_O = 1.7 V to 3.3 V,	R_L = 2 kΩ	20	200		V/mV
k_{SVS}	Supply-voltage sensitivity ($\Delta V_{IO}/\Delta V_{CC\pm}$)	$V_{CC\pm}$ = ±2.5 V to ±15 V				150	µV/V
I_{CC}	Supply current	V_O = 1.5 V and 2.5 V,	No load		0.7	1.75	mA

† All characteristics are measured under open-loop conditions, with zero common-mode input voltage, unless otherwise specified.
‡ Output swings essentially to ground.

operating characteristics, $V_{CC\pm}$ = ±15 V, T_A = 25°C, A_{VD} = 1 (unless otherwise noted)

PARAMETER		TEST CONDITIONS				TYP	UNIT
SR	Slew rate at unity gain	V_I = ±10 V,	C_L = 100 pF,	R_L = 2 kΩ,	See Figure 1	1	V/µs
t_r	Rise time	ΔV_O = 50 mV,	C_L = 100 pF,	R_L = 10 kΩ,	See Figure 1	0.35	µs
t_f	Fall time	ΔV_O = 50 mV,	C_L = 100 pF,	R_L = 10 kΩ,	See Figure 1	0.35	µs
	Overshoot factor	ΔV_O = 50 mV,	C_L = 100 pF,	R_L = 10 kΩ,	See Figure 1	20%	
	Crossover distortion	$V_{I(PP)}$ = 30 mV,	V_{OPP} = 2 V,	f = 10 kHz		1%	

PARAMETER MEASUREMENT INFORMATION

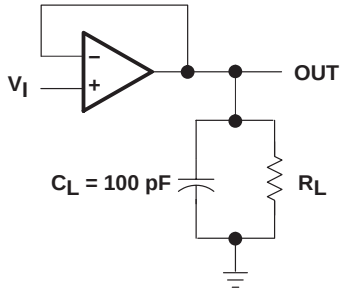


Figure 1. Unity-Gain Amplifier

TYPICAL CHARACTERISTICS†

INPUT BIAS CURRENT vs FREE-AIR TEMPERATURE

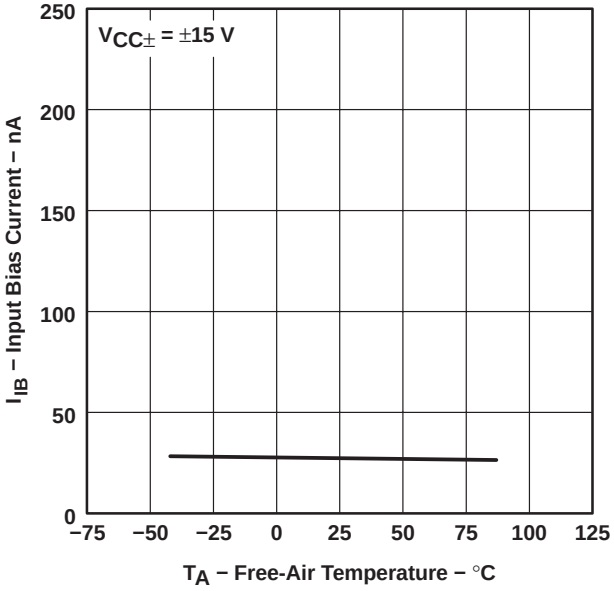


Figure 2

INPUT BIAS CURRENT vs SUPPLY VOLTAGE

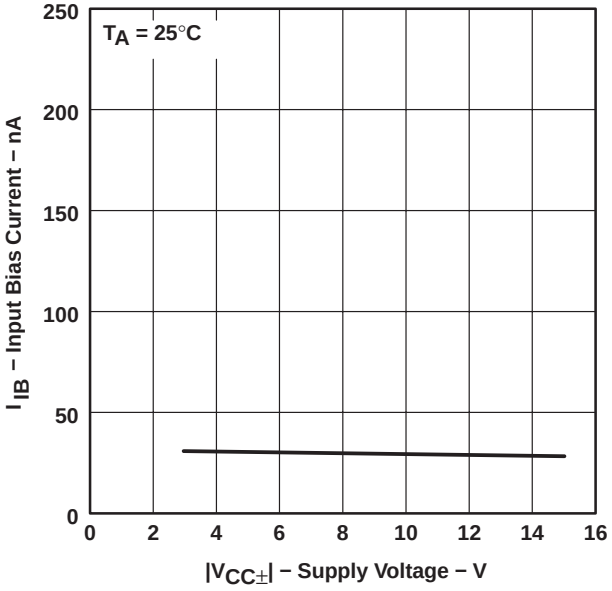


Figure 3

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE vs SUPPLY VOLTAGE

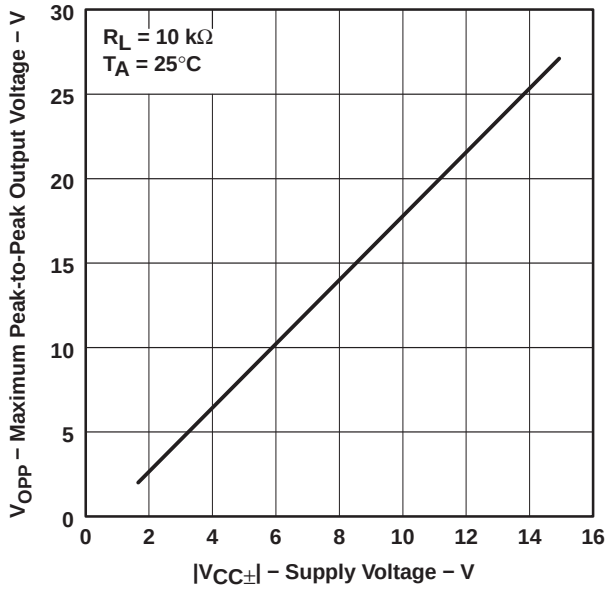


Figure 4

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE vs FREQUENCY

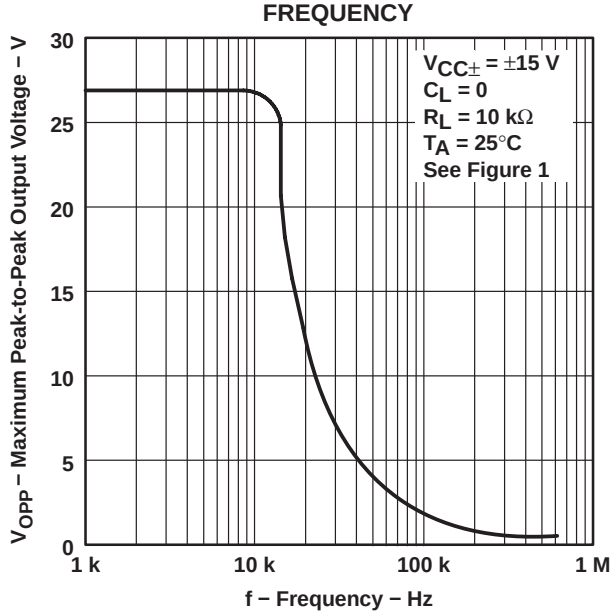


Figure 5

† Operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied.

TYPICAL CHARACTERISTICS†

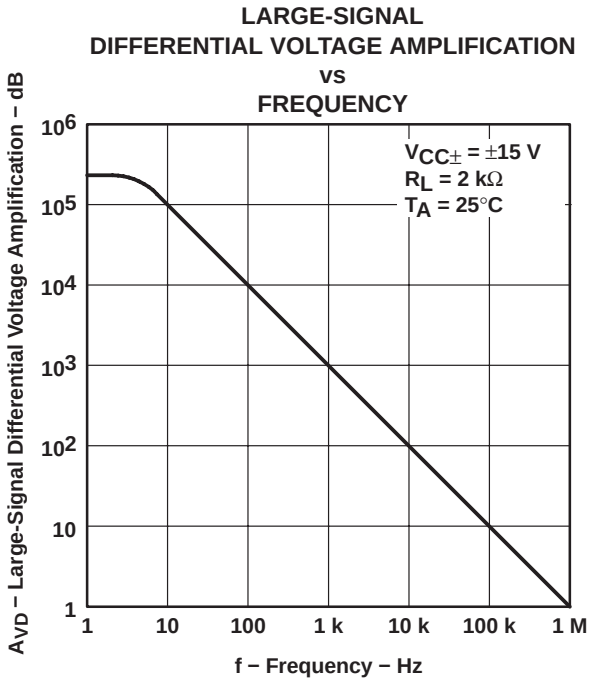


Figure 6

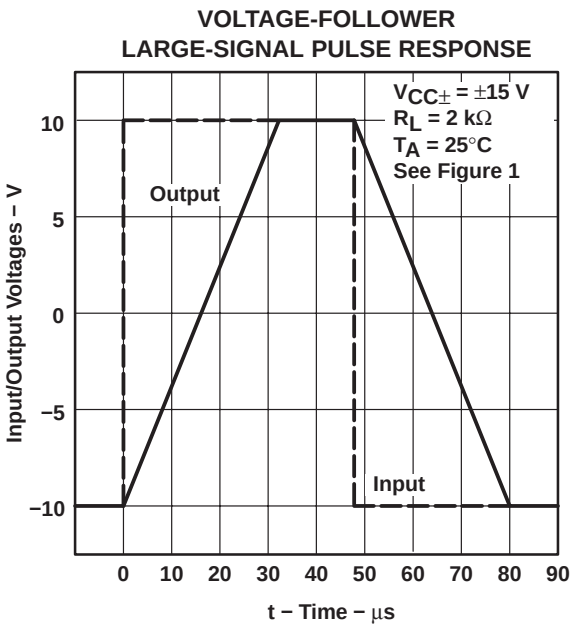


Figure 7

† Operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied.

PACKAGE OPTION ADDENDUM

18-Jul-2006

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
TL343IDBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL343IDBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL343IDBVT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL343IDBVTE4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

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