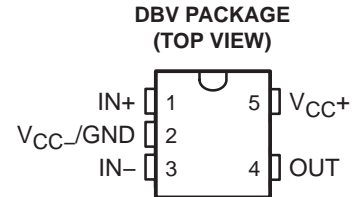


TL343 SINGLE LOW-POWER OPERATIONAL AMPLIFIER

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- 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



description/ordering information

The TL343 is a single operational amplifier similar in performance to the μ A741, 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.

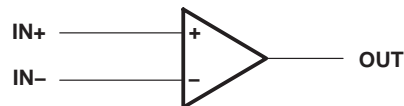
ORDERING INFORMATION

T_A	$V_{IO\text{MAX}}$ 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
			Reel of 250	TL343IDBVT
				T4I_

† 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



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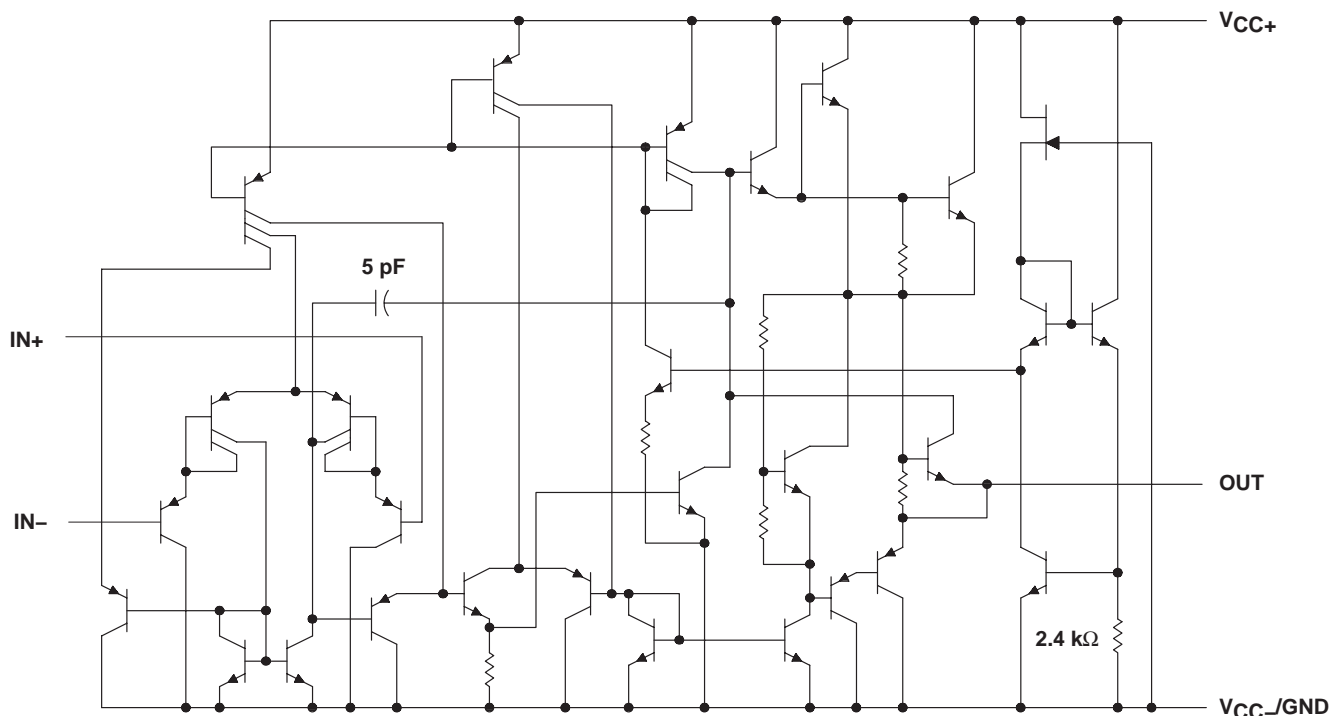
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schematic



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)/ θ_{JA} . Selecting the maximum of 150°C can affect reliability.
 5. The package thermal impedance is calculated in accordance with JESD 51-7.

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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, $V_{CC\pm} = \pm 15$ V (unless otherwise noted)

PARAMETER		TEST CONDITION [†]		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		$\mu\text{V}/^\circ\text{C}$
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		$\text{pA}/^\circ\text{C}$
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	$R_L = 10\text{ k}\Omega$	25°C	± 12	± 13.5		V
			25°C	± 10	± 13		
			Full range	± 10			
A_{VD}	Large-signal differential voltage amplification	$V_O = \pm 10\text{ V}, R_L = 2\text{ k}\Omega$	25°C	20	200		V/mV
			Full range	15			
B_{OM}	Maximum-output-swing bandwidth	$V_{OPP} = 20\text{ V},$ THD $\leq 5\%,$ $R_L = 2\text{ k}\Omega$	25°C		9		kHz
B_1	Unity-gain bandwidth	$V_O = 50\text{ mV}, R_L = 10\text{ k}\Omega$	25°C		1		MHz
ϕ_m	Phase margin	$C_L = 200\text{ pF}, R_L = 2\text{ k}\Omega$	25°C		44		Deg
r_i	Input resistance	$f = 20\text{ Hz}$	25°C	0.3	1		$\text{M}\Omega$
r_o	Output resistance	$f = 20\text{ Hz}$	25°C		75		Ω
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}(\text{min})$	25°C	70	90		dB
k_{SVS}	Supply-voltage sensitivity ($\Delta V_{IO}/\Delta V_{CC}$)	$V_{CC\pm} = \pm 2.5$ to $\pm 15\text{ V}$	25°C		30	150	$\mu\text{V}/\text{V}$
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 $V_O = 0$.

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electrical characteristics, $V_{CC+} = 3\text{ V}$ and 5 V , $V_{CC-} = 0\text{ V}$, $T_A = 25^\circ\text{C}$ (unless otherwise noted)

PARAMETER	TEST CONDITION†	MIN	TYP	MAX	UNIT
V_{IO} Input offset voltage	$V_O = 1.5\text{ V}$ and 2.5 V		2	10	mV
I_{IO} Input offset current	$V_O = 1.5\text{ V}$ and 2.5 V		30	50	nA
I_{IB} Input bias current	$V_O = 1.5\text{ V}$ and 2.5 V		-200	-500	nA
V_{OM} Peak output voltage swing‡	$R_L = 10\text{ k}\Omega$	3.3	3.5		V
A_{VD} Large-signal differential voltage amplification	$V_O = 1.7\text{ V}$ to 3.3 V , $R_L = 2\text{ k}\Omega$	20	200		V/mV
k_{SVS} Supply-voltage sensitivity ($\Delta V_{IO}/\Delta V_{CC\pm}$)	$V_{CC\pm} = \pm 2.5\text{ V}$ to $\pm 15\text{ V}$			150	$\mu\text{V}/\text{V}$
I_{CC} Supply current	$V_O = 1.5\text{ V}$ 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, $V_{CC\pm} = \pm 15\text{ V}$, $T_A = 25^\circ\text{C}$, $A_{VD} = 1$ (unless otherwise noted)

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

PARAMETER MEASUREMENT INFORMATION

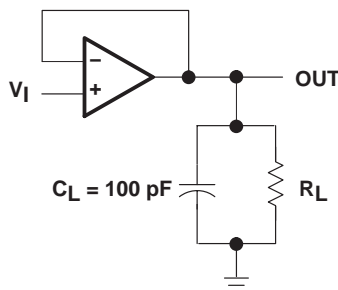


Figure 1. Unity-Gain Amplifier

TYPICAL CHARACTERISTICS†

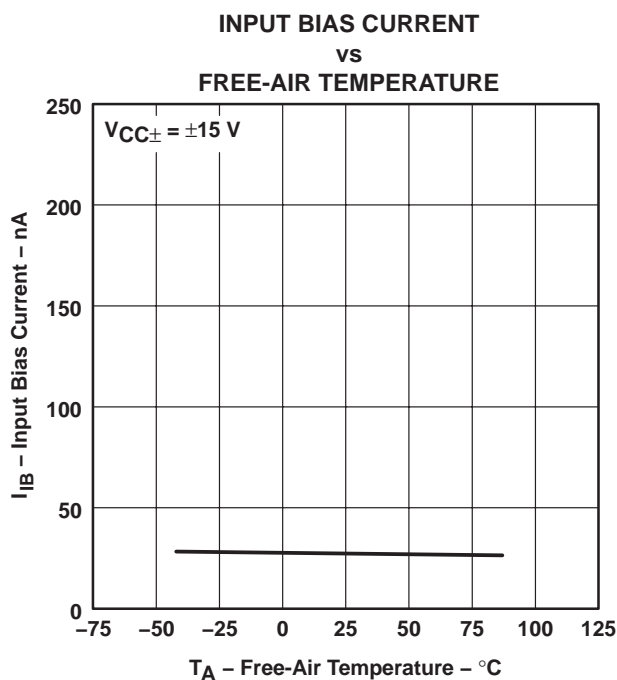


Figure 2

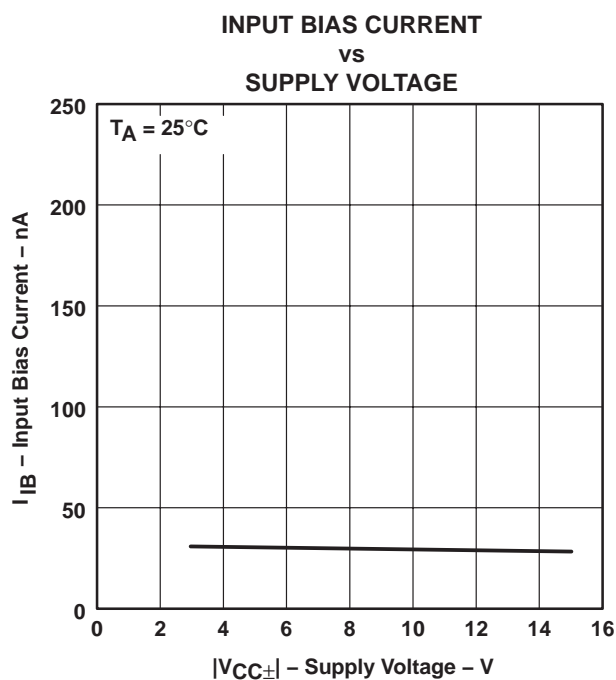


Figure 3

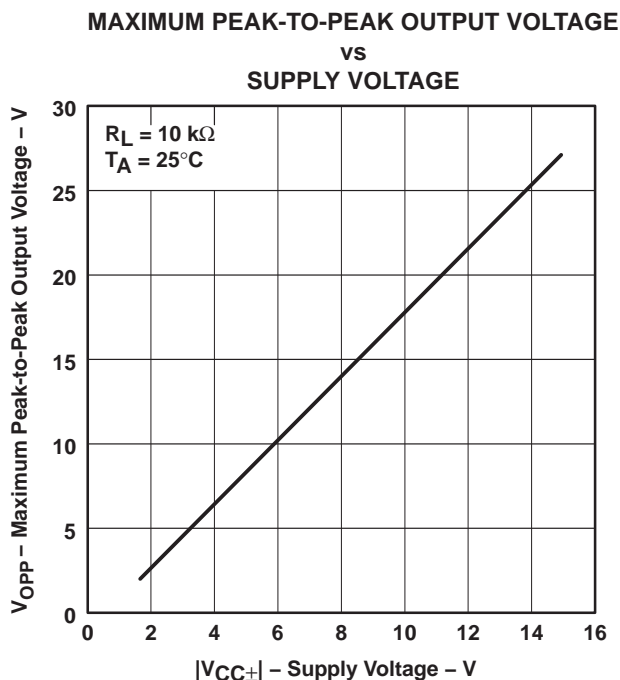


Figure 4

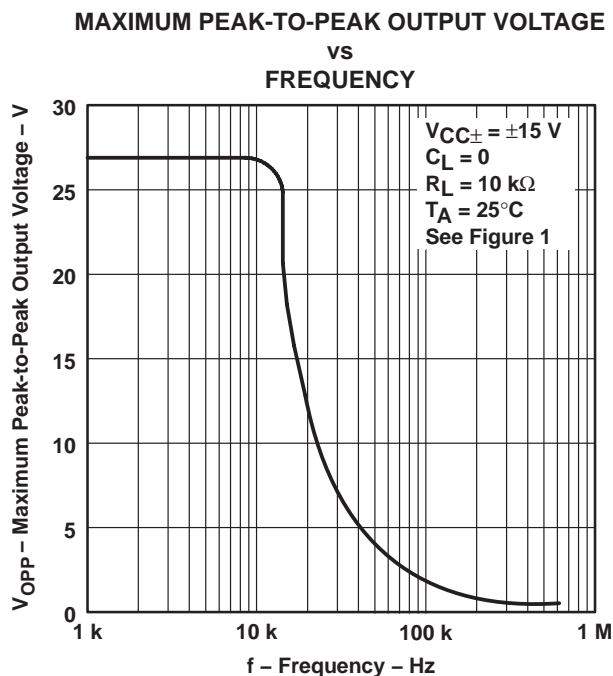


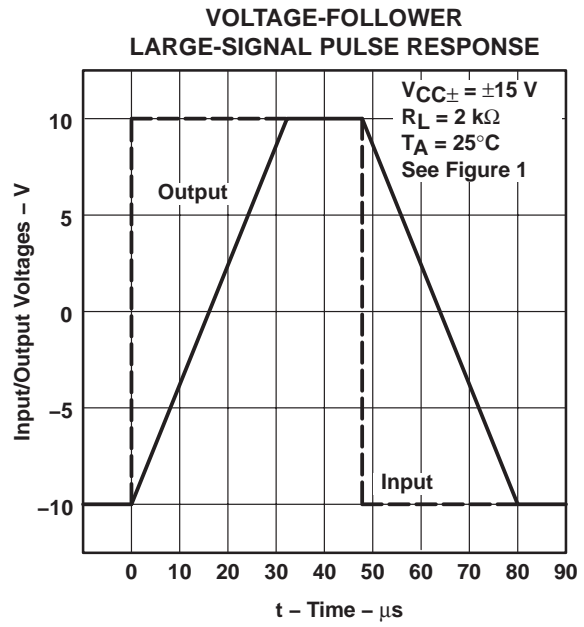
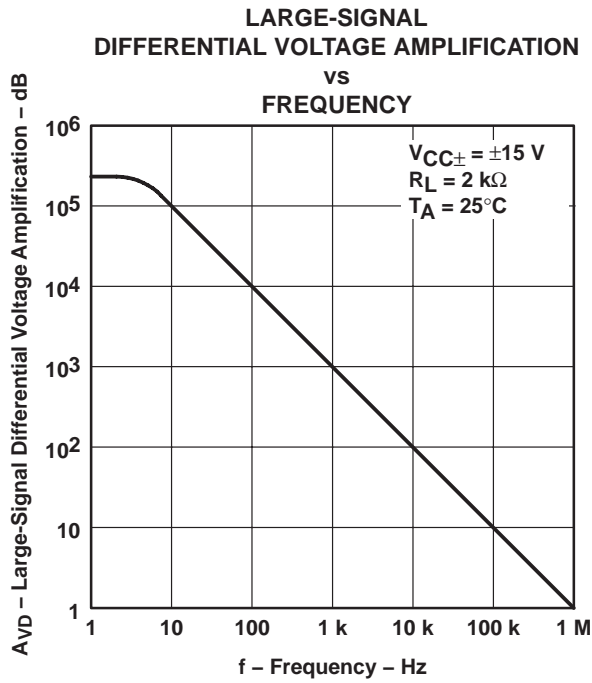
Figure 5

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

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TYPICAL CHARACTERISTICS†



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

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
TL3431DBVR	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3431DBVRE4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3431DBVRG4	ACTIVE	SOT-23	DBV	5	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3431DBVBT	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3431DBVTE4	ACTIVE	SOT-23	DBV	5	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TL3431DBVTG4	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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TAPE AND REEL INFORMATION

QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TL343IDBVR	SOT-23	DBV	5	3000	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TL343IDBVR	SOT-23	DBV	5	3000	180.0	9.2	3.17	3.23	1.37	4.0	8.0	Q3
TL343IDBVT	SOT-23	DBV	5	250	178.0	9.0	3.23	3.17	1.37	4.0	8.0	Q3
TL343IDBVT	SOT-23	DBV	5	250	180.0	9.2	3.17	3.23	1.37	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TL3431DBVR	SOT-23	DBV	5	3000	180.0	180.0	18.0
TL3431DBVR	SOT-23	DBV	5	3000	205.0	200.0	33.0
TL3431DBVT	SOT-23	DBV	5	250	180.0	180.0	18.0
TL3431DBVT	SOT-23	DBV	5	250	205.0	200.0	33.0

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