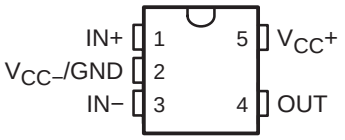
- **Wide Range of Supply Voltages, Single Supply 3 V to 30 V, or Dual Supplies**
- **Class AB Output Stage**
- **True Differential-Input Stage**
- **Low Input Bias Current**
- **Internal Frequency Compensation**
- **Short-Circuit Protection**

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.

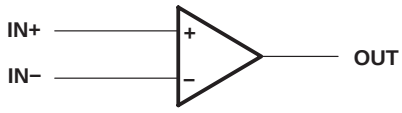
ORDERING INFORMATION

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	

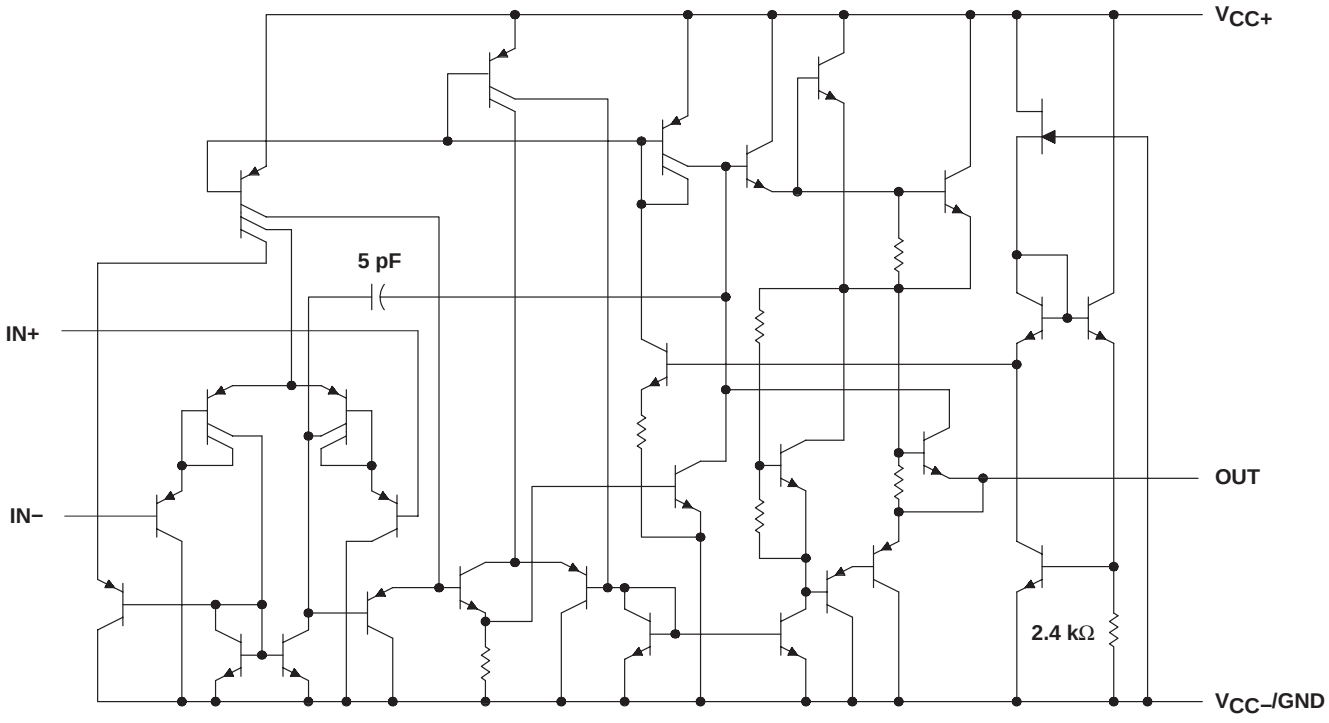
† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

‡ 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

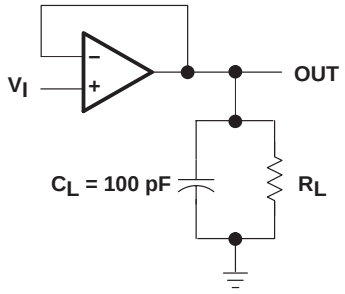


Figure 1. Unity-Gain Amplifier

TYPICAL CHARACTERISTICS†

INPUT BIAS CURRENT vs FREE-AIR TEMPERATURE

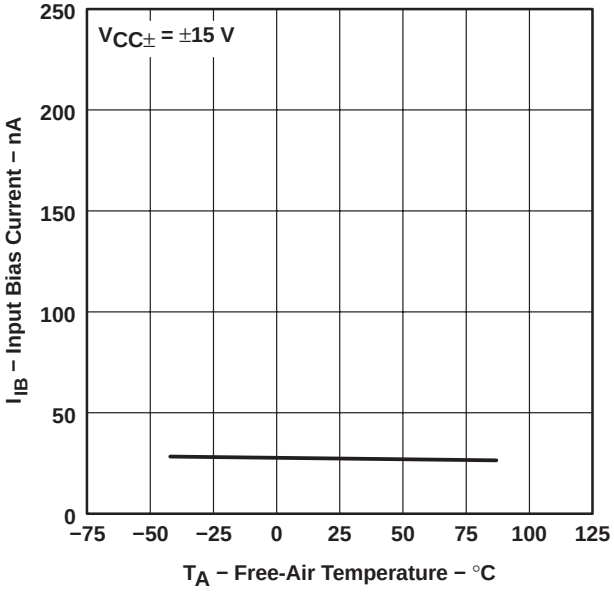


Figure 2

INPUT BIAS CURRENT vs SUPPLY VOLTAGE

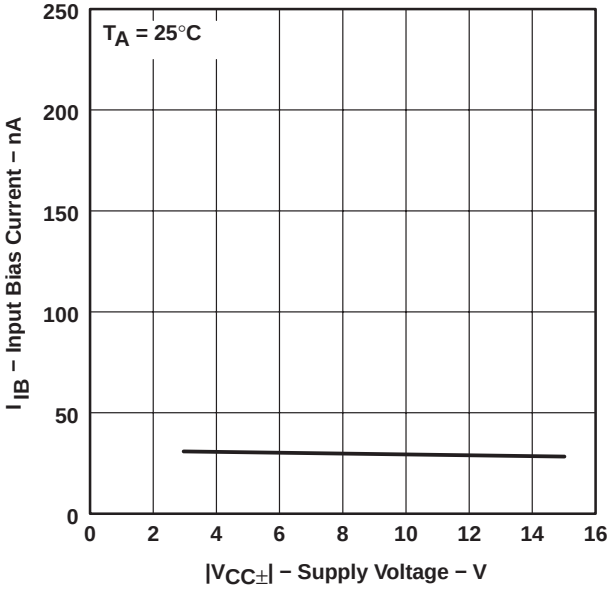


Figure 3

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE vs SUPPLY VOLTAGE

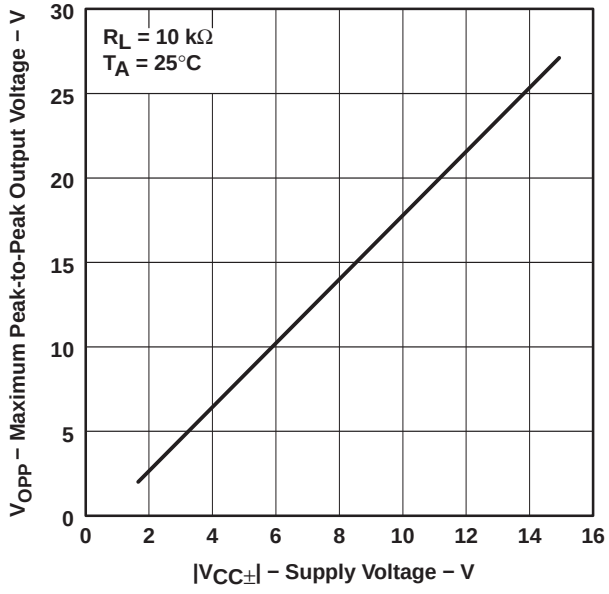


Figure 4

MAXIMUM PEAK-TO-PEAK OUTPUT VOLTAGE vs FREQUENCY

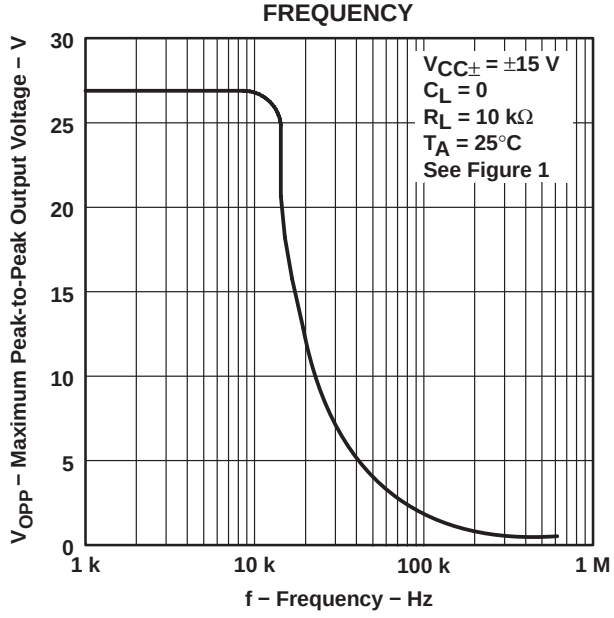


Figure 5

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

TYPICAL CHARACTERISTICS†

LARGE-SIGNAL DIFFERENTIAL VOLTAGE AMPLIFICATION vs FREQUENCY

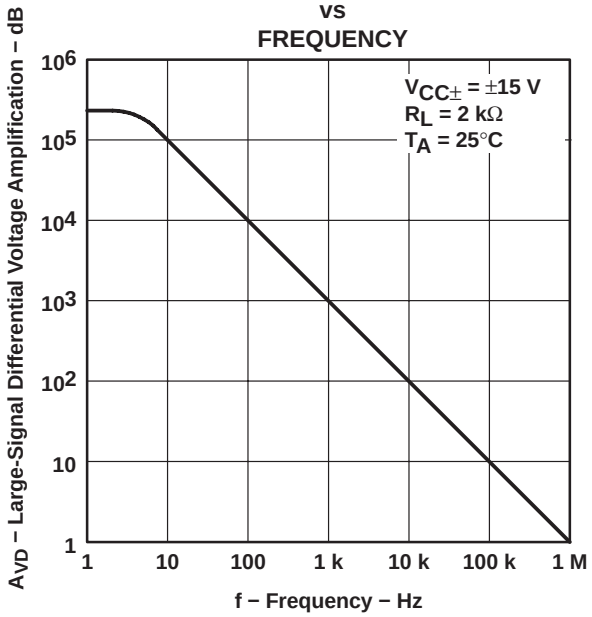


Figure 6

VOLTAGE-FOLLOWER LARGE-SIGNAL PULSE RESPONSE

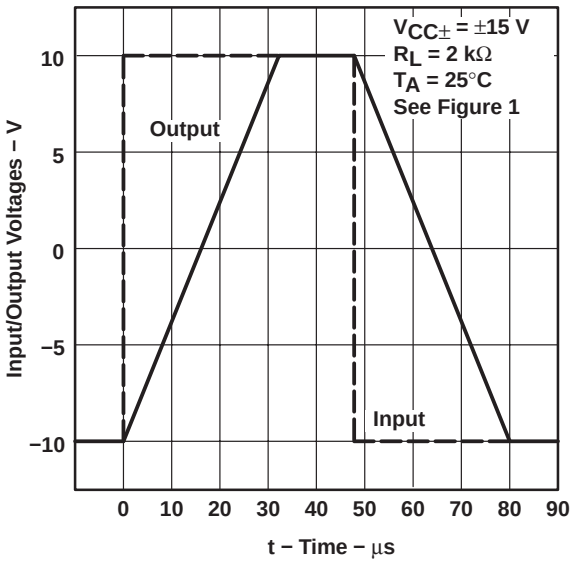


Figure 7

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

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
TL343IDBVR	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU | SN	Level-1-260C-UNLIM	-40 to 125	(T41J, T4IG, T4IJ, T4IL, T4IS)
TL343IDBVR.A	Active	Production	SOT-23 (DBV) | 5	3000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 125	(T41J, T4IG, T4IJ, T4IL, T4IS)
TL343IDBVT	Obsolete	Production	SOT-23 (DBV) | 5	-	-	Call TI	Call TI	-40 to 125	(T4IG, T4IJ, T4IL, T4IU)

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

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

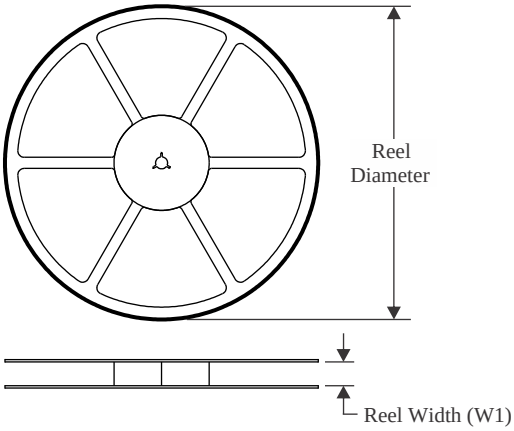
(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

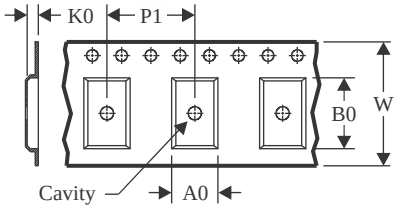
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

TAPE AND REEL INFORMATION

REEL DIMENSIONS

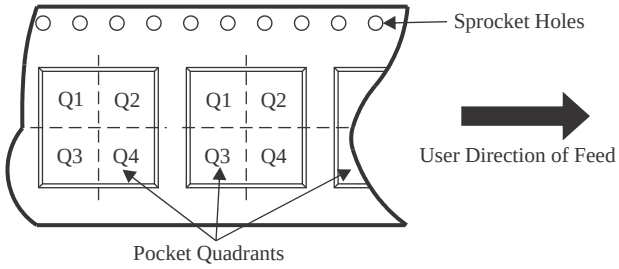


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

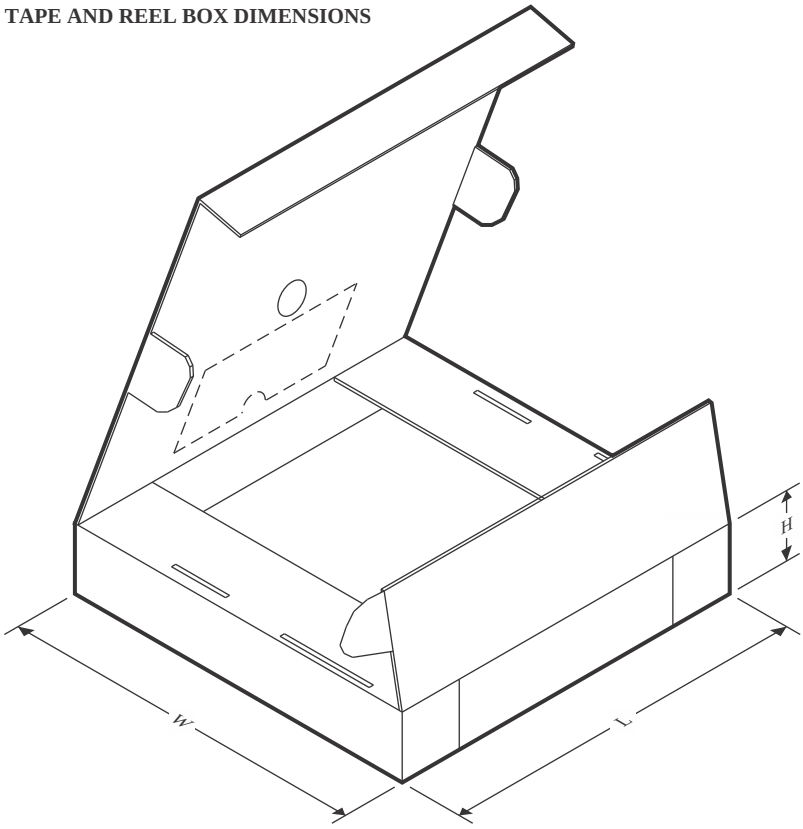
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	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	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3
TL343IDBVR	SOT-23	DBV	5	3000	180.0	8.4	3.2	3.2	1.4	4.0	8.0	Q3

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

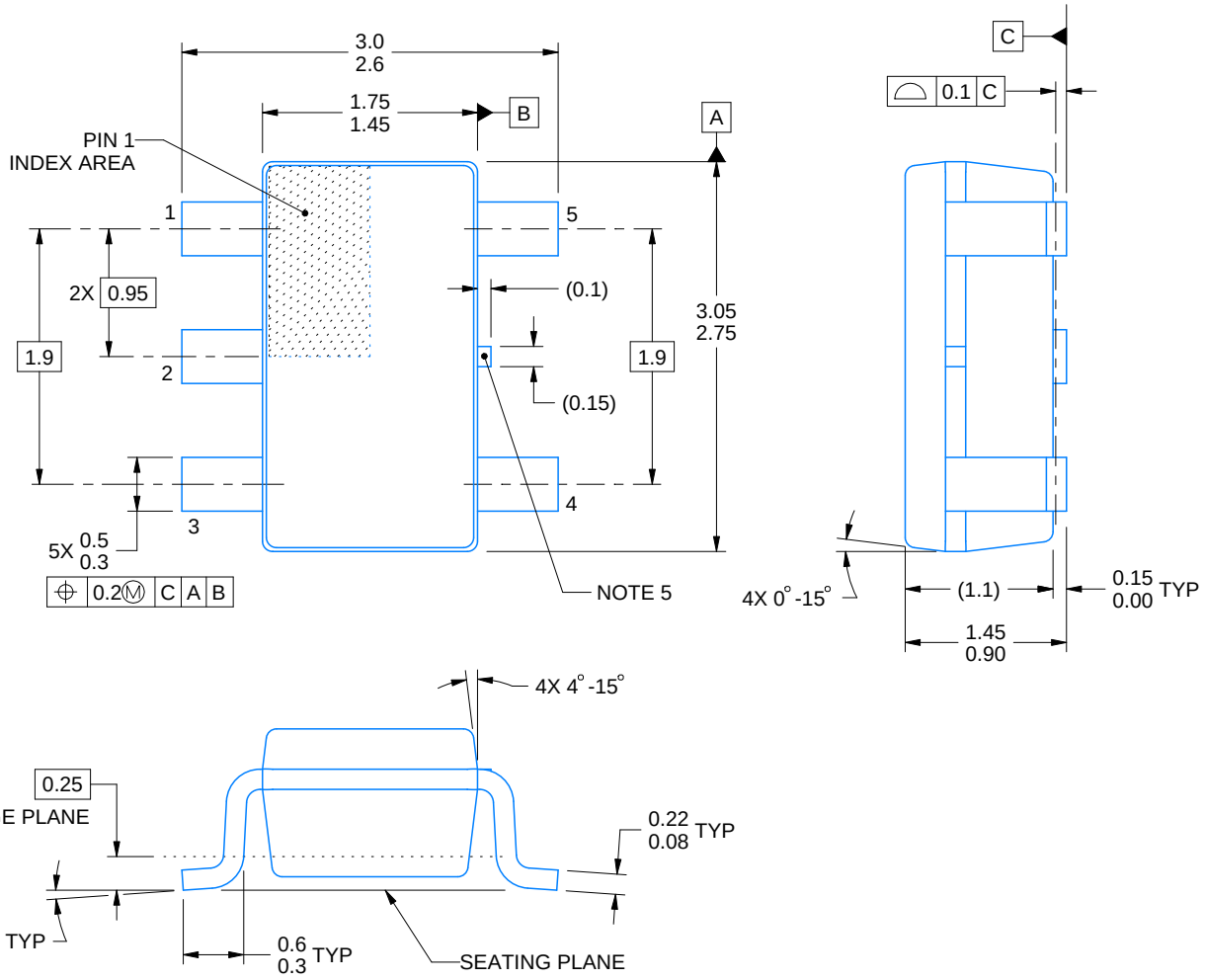
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TL343IDBVR	SOT-23	DBV	5	3000	210.0	185.0	35.0
TL343IDBVR	SOT-23	DBV	5	3000	210.0	185.0	35.0

PACKAGE OUTLINE

DBV0005A

SOT-23 - 1.45 mm max height

SMALL OUTLINE TRANSISTOR



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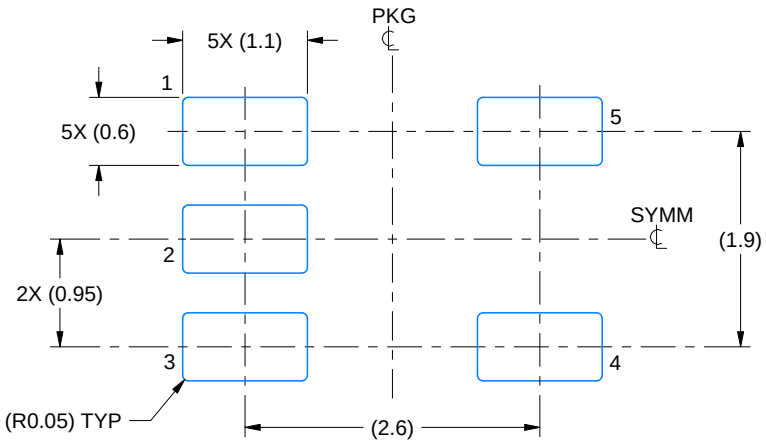
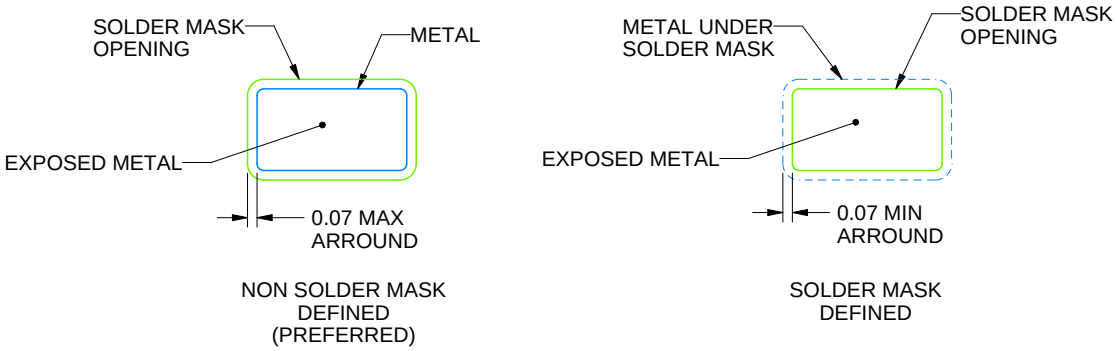
NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Refernce JEDEC MO-178.
4. Body dimensions do not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.25 mm per side.
5. Support pin may differ or may not be present.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:15X



SOLDER MASK DETAILS

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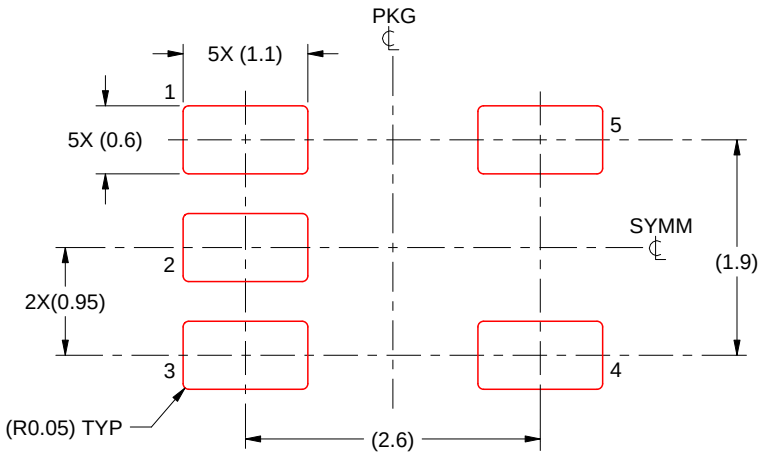
NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE:15X

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NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

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