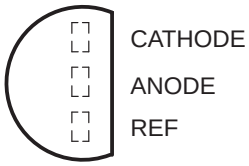
SLVS050D − JUNE 1976 − REVISED JANUARY 2005

- **Temperature Compensated**
- **Programmable Output Voltage**
- **Low Output Resistance**
- **Low Output Noise**
- **Sink Capability up to 100 mA**

LP PACKAGE
(TOP VIEW)



description/ordering information

The TL430 is a 3-terminal adjustable shunt regulator, featuring excellent temperature stability, wide operating current range, and low output noise. The output voltage can be set by two external resistors to any desired value between 3 V and 30 V. The TL430 can replace Zener diodes in many applications, providing improved performance.

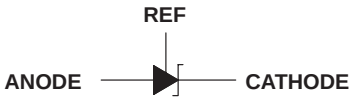
The TL430C is characterized for operation from 0°C to 70°C.

ORDERING INFORMATION

T_A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	TO-226 / TO-92 (LP)	Bulk of 1000	TL430CLP	TL430C
		Reel of 2000	TL430CLPR	

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

symbol



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.

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

Regulator voltage (see Note 1) . . . . . 30 V
Continuous regulator current . . . . . 150 mA
Package thermal impedance, θ_{JA} (see Notes 2 and 3) . . . . . 140°C/W
Operating virtual junction temperature, T_J . . . . . 150°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds . . . . . 260°C
Storage temperature range, T_{stg} . . . . . −65°C to 150°C

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

NOTES: 1. All voltage values are with respect to the anode terminal.
2. 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 impact reliability.
3. The package thermal impedance is calculated in accordance with JESD 51-7.

recommended operating conditions

			MIN	MAX	UNIT
V_Z	Regulator voltage		V_{ref}	30	V
I_Z	Regulator current		2	100	mA
T_A	Operating free-air temperature range	TL430C	0	70	°C

electrical characteristics over recommended operating conditions, T_A = 25°C (unless otherwise noted)

PARAMETER		TEST FIGURE	TEST CONDITIONS		TL430C			UNIT
					MIN	TYP	MAX	
$V_{I(ref)}$	Reference input voltage	1	$V_Z = V_{I(ref)}$,	I_Z = 10 mA	2.5	2.75	3	V
$\alpha V_{I(ref)}$	Temperature coefficient of reference input voltage	1	$V_Z = V_{I(ref)}$, T_A = 0°C to 70°C	I_Z = 10 mA,		120		ppm/°C
$I_{I(ref)}$	Reference input current	2	I_Z = 10 mA, R2 = ∞	R1 = 10 kΩ,		3	10	μA
I_{ZK}	Regulator current near lower knee of regulation range	1	$V_Z = V_{I(ref)}$			0.5	2	mA
I_{ZK}	Regulator current at maximum limit of regulation range	1	$V_Z = V_{I(ref)}$		50			mA
		2	V_Z = 5 V to 30 V,	See Note 4	100			
r_z	Differential regulator resistance (see Note 5)	1	$V_Z = V_{I(ref)}$, ΔI_Z = (52 − 2) mA			1.5	3	Ω
V_n	Noise voltage	2	f = 0.1 Hz to 10 Hz	V_Z = 3 V		50		μV
				V_Z = 12 V		200		
				V_Z = 30 V		650		

NOTES: 4. The average power dissipation, $V_Z \bullet I_Z \bullet$ duty cycle, must not exceed the maximum continuous rating in any 10-ms interval.
5. The regulator resistance for $V_Z > V_{I(ref)}$, r_z, is given by:

$$r_z' = r_z\left(1 + \frac{R1}{R2}\right)$$

PARAMETER MEASUREMENT INFORMATION

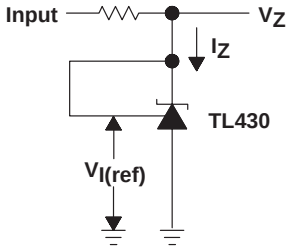
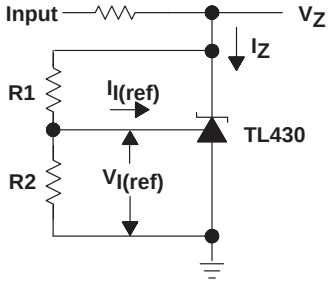


Figure 1. Test Circuit for $V_Z = V_{I(ref)}$



$$V_Z = V_{I(ref)}\left(1 + \frac{R1}{R2}\right) + I_{I(ref)} \times R1$$

Figure 2. Test Circuit for $V_Z > V_{I(ref)}$

TYPICAL CHARACTERISTICS

SMALL-SIGNAL REGULATOR IMPEDANCE vs FREQUENCY

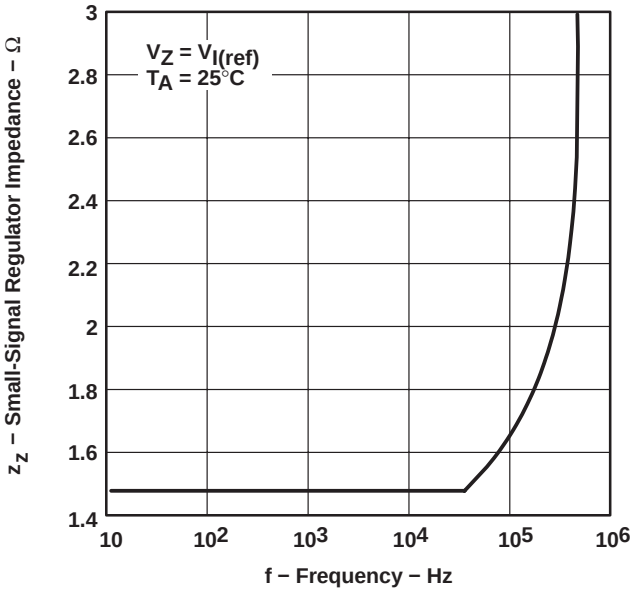


Figure 3

CATHODE CURRENT vs CATHODE VOLTAGE

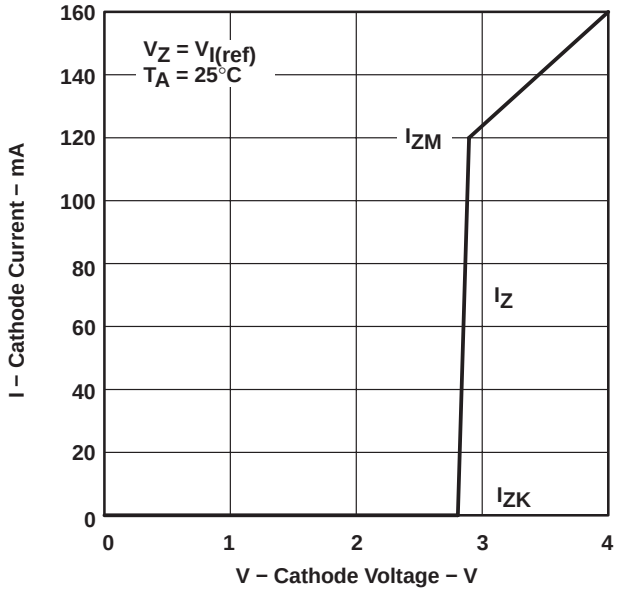
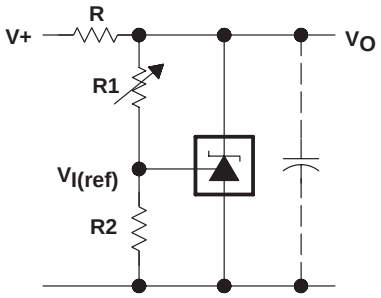


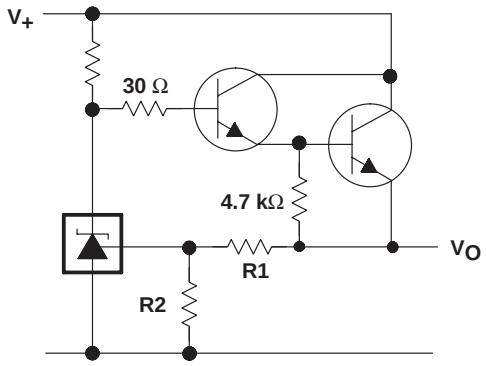
Figure 4

APPLICATION INFORMATION



$$V_O \approx \left(1 + \frac{R1}{R2}\right) V_{I(ref)}$$

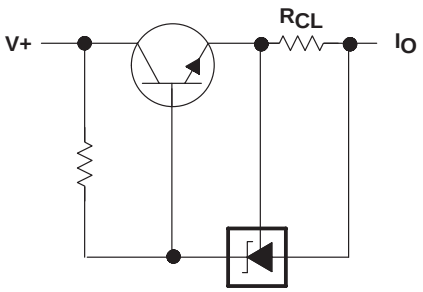
Figure 5. Shunt Regulator



$$V_O \approx \left(1 + \frac{R1}{R2}\right) V_{I(ref)}$$

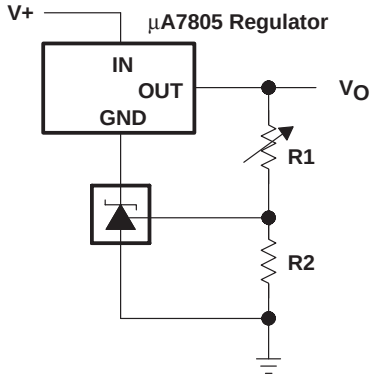
Figure 6. Series Regulator

APPLICATION INFORMATION



$$I_O \approx \frac{V_{I(ref)}}{R_{CL}}$$

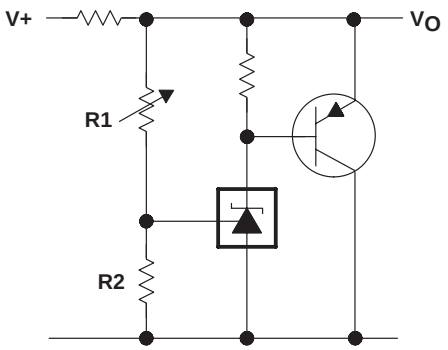
Figure 7. Current Limiter



$$V_O = \left(1 + \frac{R1}{R2}\right) V_{I(ref)}$$

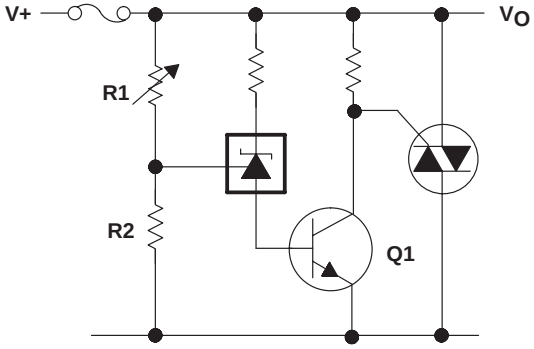
$$\text{Min } V_O = V_{I(ref)} + 5\,V$$

Figure 8. Output Control of a 3-Terminal Fixed Regulator



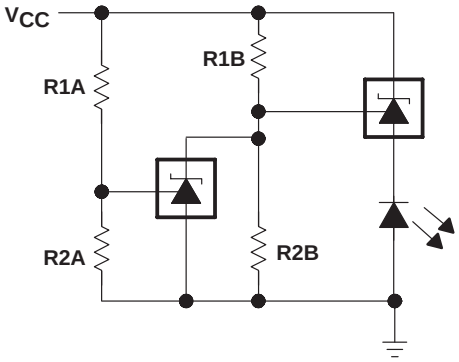
$$V_O \approx \left(1 + \frac{R1}{R2}\right) V_{I(ref)}$$

Figure 9. Higher-Current Applications



$$V_{limit} \approx \left(1 + \frac{R1}{R2}\right)\left(V_{I(ref)} + V_{BE(Q1)}\right)$$

Figure 10. Crowbar



$$\text{Low limit} \approx V_{I(ref)}\left(1 + \frac{R1B}{R2B}\right) + V_D$$

$$\text{High limit} \approx V_{I(ref)}\left(1 + \frac{R1A}{R2A}\right)$$

Figure 11. V_{CC} Monitor

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)
TL430CLP	Active	Production	TO-92 (LP) | 3	1000 | BULK	Yes	SN	N/A for Pkg Type	0 to 70	TL430C
TL430CLP.A	Active	Production	TO-92 (LP) | 3	1000 | BULK	Yes	SN	N/A for Pkg Type	0 to 70	TL430C

(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.

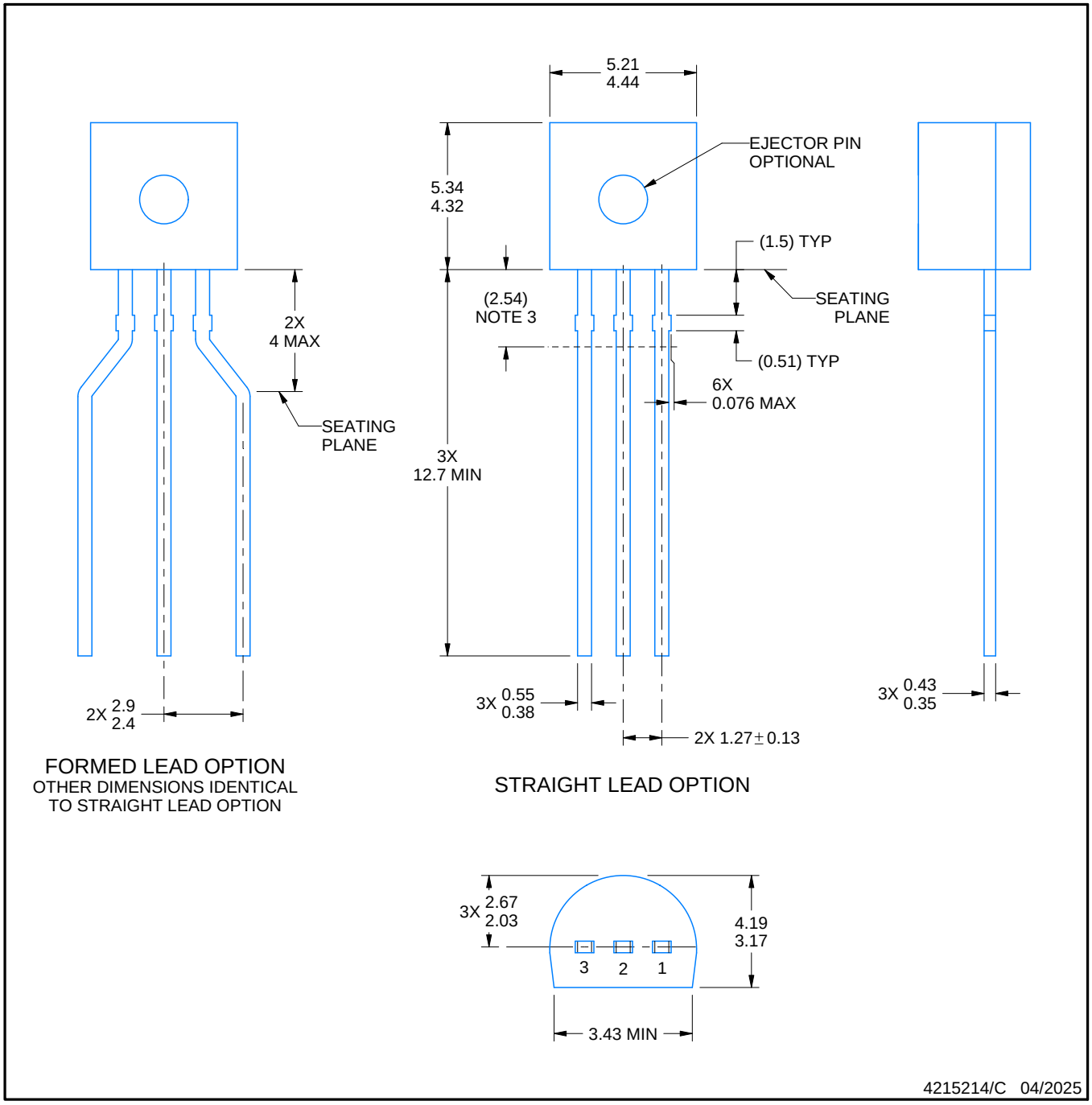
Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

LP0003A

PACKAGE OUTLINE

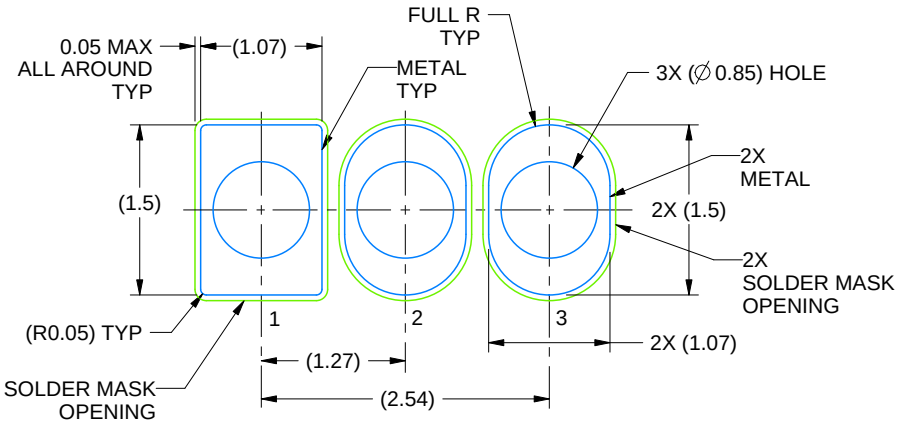
TO-92 - 5.34 mm max height

TO-92

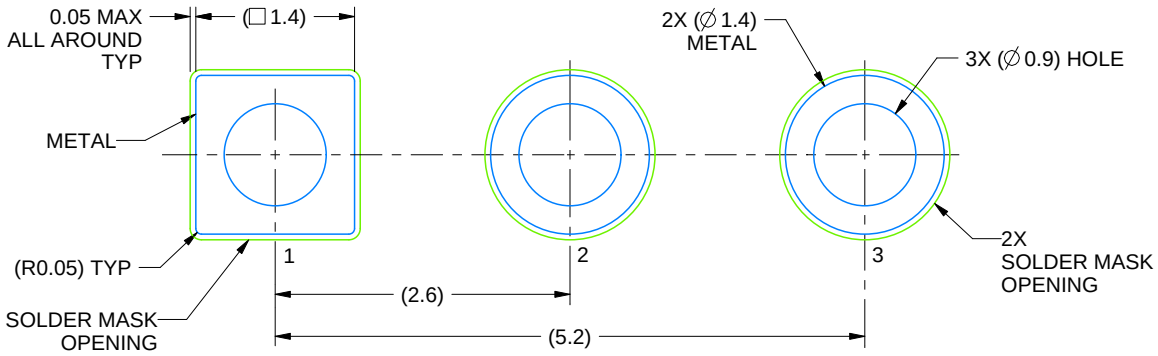


NOTES:

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. Lead dimensions are not controlled within this area.
4. Reference JEDEC TO-226, variation AA.
5. Shipping method:
   a. Straight lead option available in bulk pack only.
   b. Formed lead option available in tape and reel or ammo pack.
   c. Specific products can be offered in limited combinations of shipping medium and lead options.
   d. Consult product folder for more information on available options.



LAND PATTERN EXAMPLE
STRAIGHT LEAD OPTION
NON-SOLDER MASK DEFINED
SCALE:15X



LAND PATTERN EXAMPLE
FORMED LEAD OPTION
NON-SOLDER MASK DEFINED
SCALE:15X

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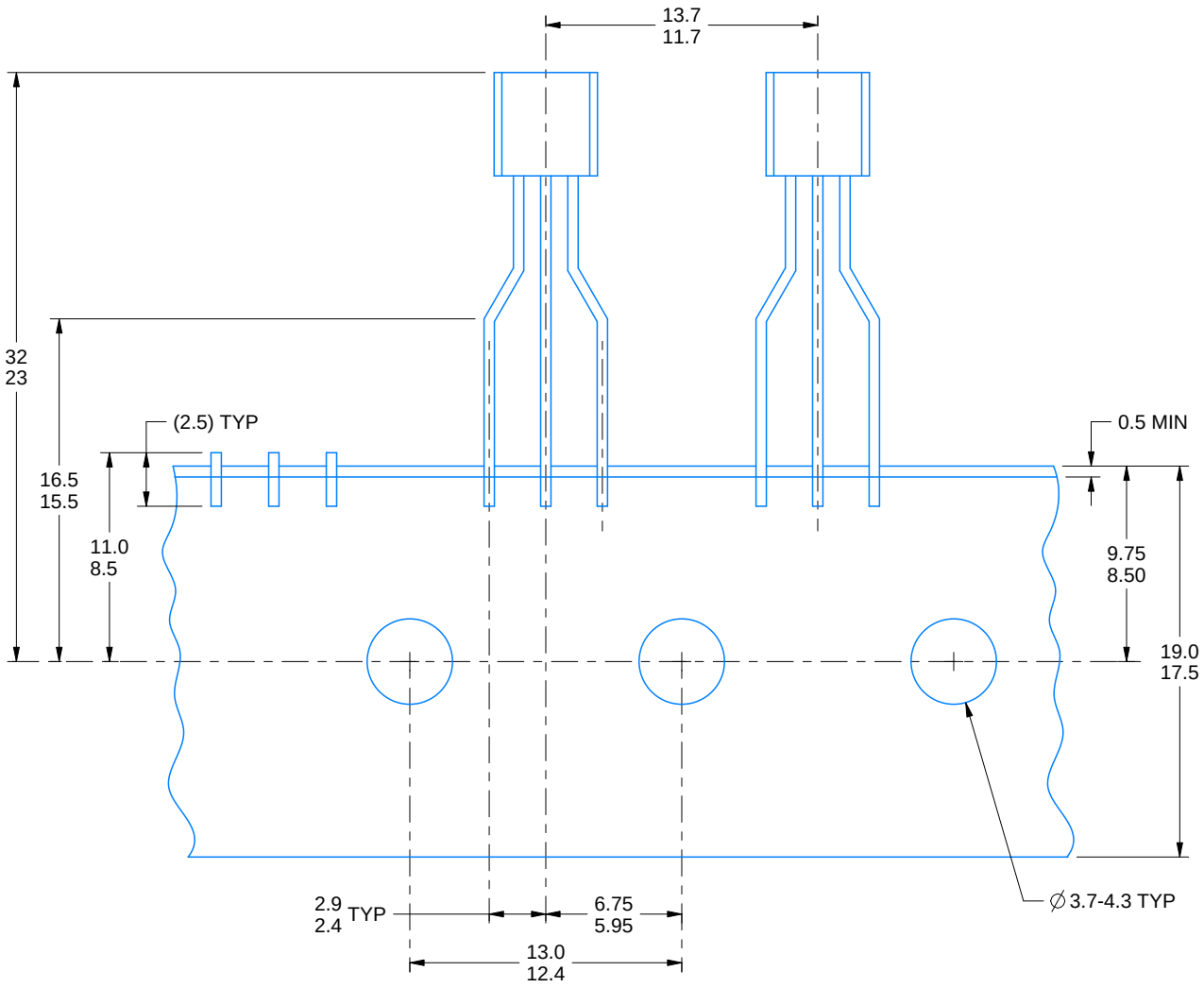
LP0003A

TO-92 - 5.34 mm max height

TO-92



FOR FORMED LEAD OPTION PACKAGE

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