

- 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



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

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TL430

ADJUSTABLE SHUNT REGULATORS

SLVS050D – JUNE 1976 – REVISED JANUARY 2005

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 $T_J(\text{max})$, θ_{JA} , and T_A . The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(\text{max}) - T_A)/\theta_{JA}$. 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, $T_A = 25^\circ\text{C}$ (unless otherwise noted)

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

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

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



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PARAMETER MEASUREMENT INFORMATION

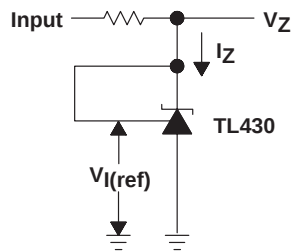
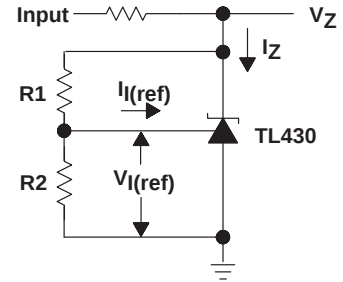


Figure 1. Test Circuit for $V_Z = V_{I(ref)}$



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

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

TL430

ADJUSTABLE SHUNT REGULATORS

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TYPICAL CHARACTERISTICS

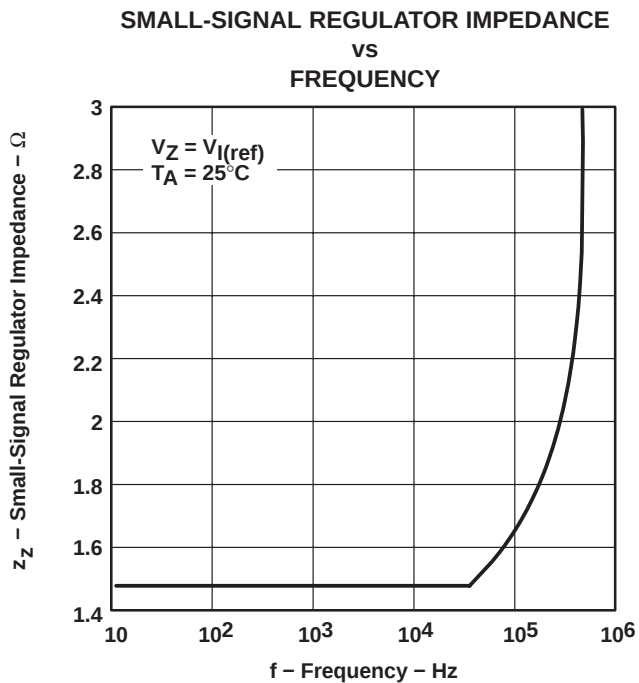


Figure 3

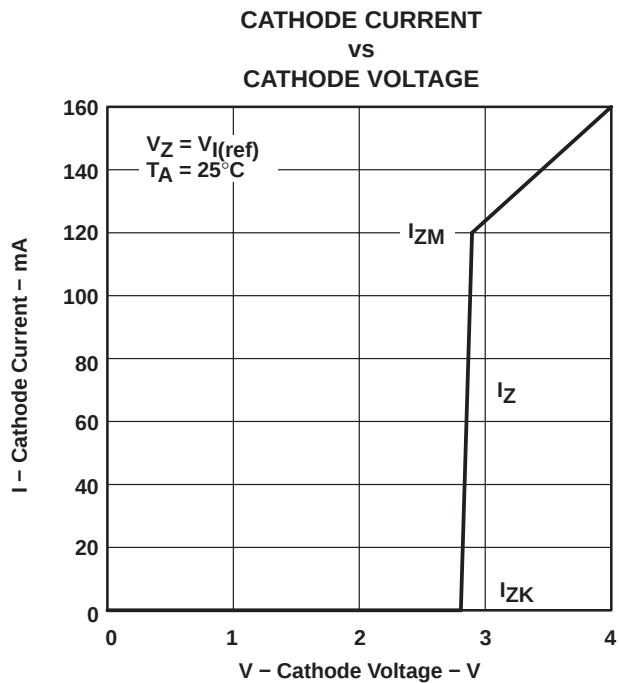


Figure 4

APPLICATION INFORMATION

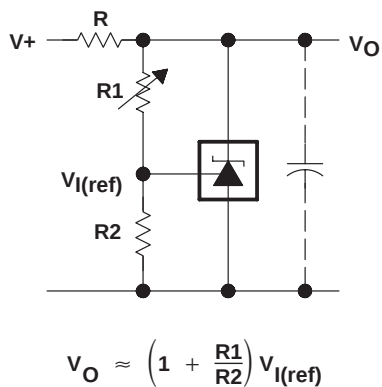


Figure 5. Shunt Regulator

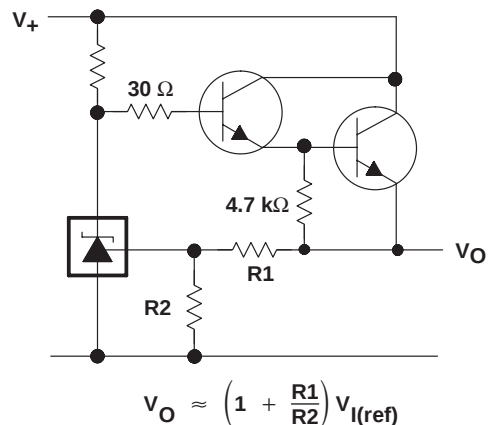


Figure 6. Series Regulator

APPLICATION INFORMATION

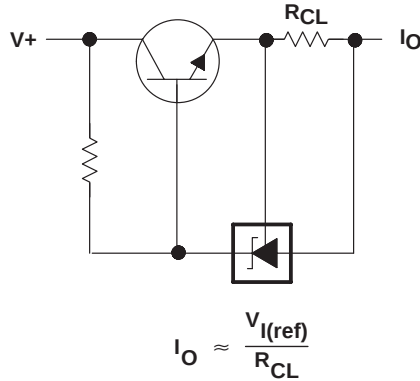
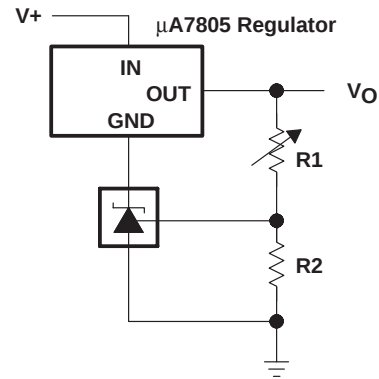


Figure 7. Current Limiter



$$V_O = \left(1 + \frac{R_1}{R_2}\right) V_{I(\text{ref})}$$

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

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

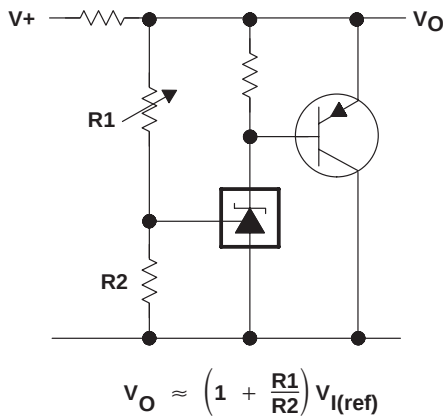


Figure 9. Higher-Current Applications

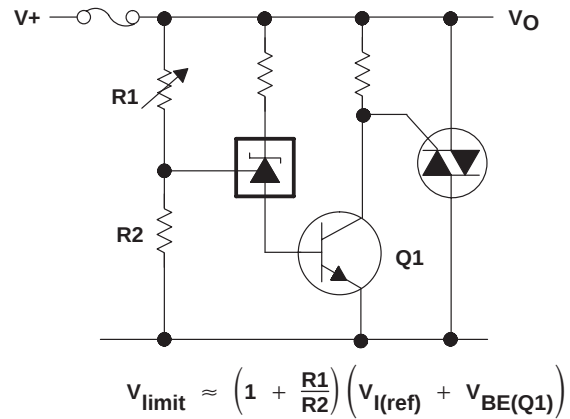


Figure 10. Crowbar

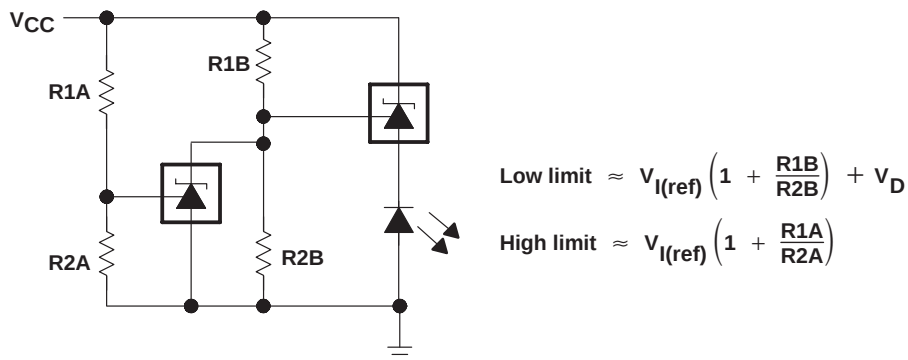


Figure 11. V_{CC} Monitor

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
TL430CLP	ACTIVE	TO-92	LP	3	1000	RoHS & Green	SN	N / A for Pkg Type	0 to 70	TL430C	Samples
TL430CLPE3	ACTIVE	TO-92	LP	3	1000	RoHS & Green	SN	N / A for Pkg Type	0 to 70	TL430C	Samples

(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) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

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

(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.

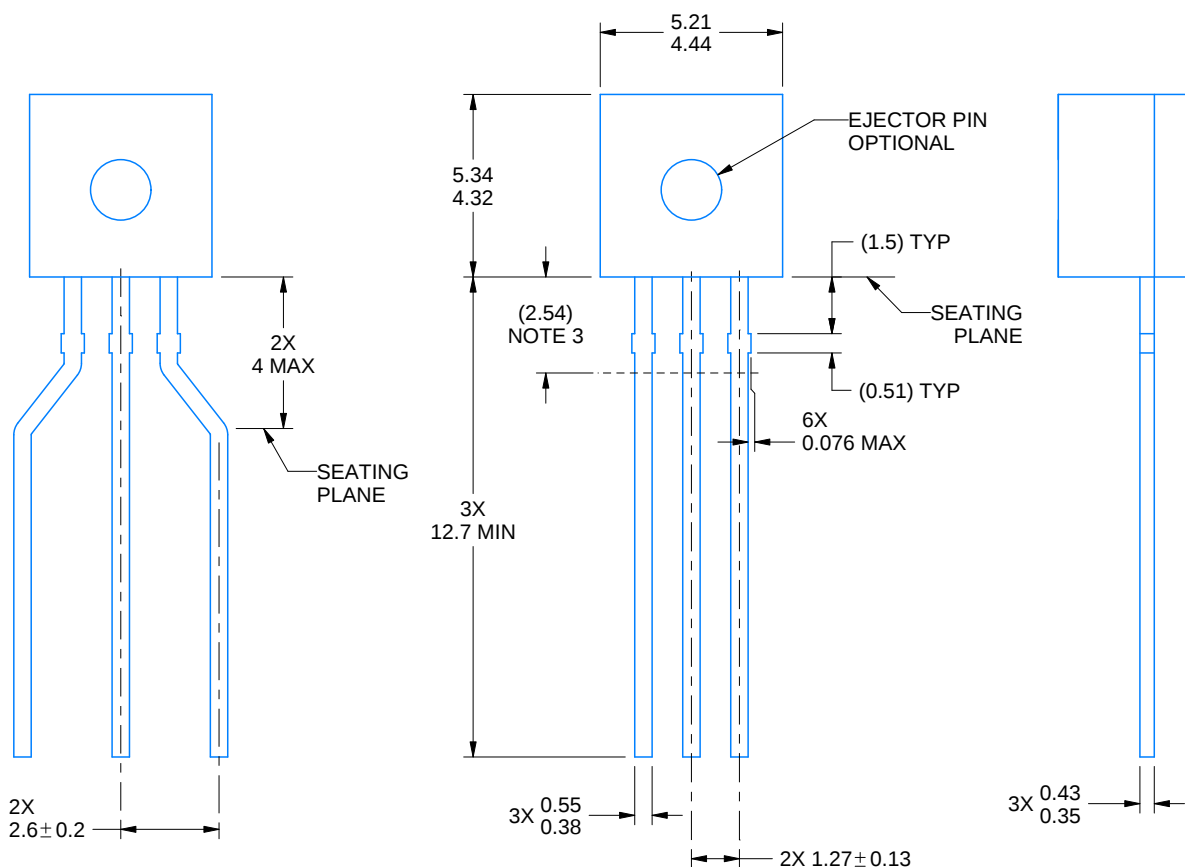
(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.



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NOTES:

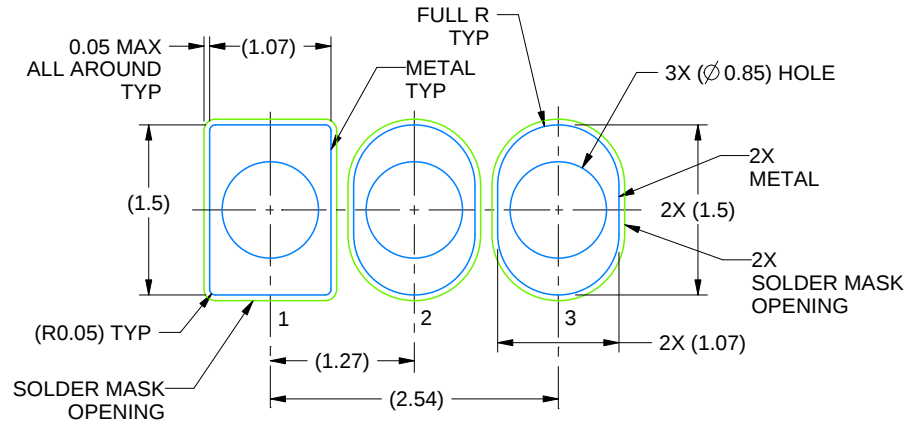
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Lead dimensions are not controlled within this area.
4. Reference JEDEC TO-226, variation AA.
5. Shipping 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.

EXAMPLE BOARD LAYOUT

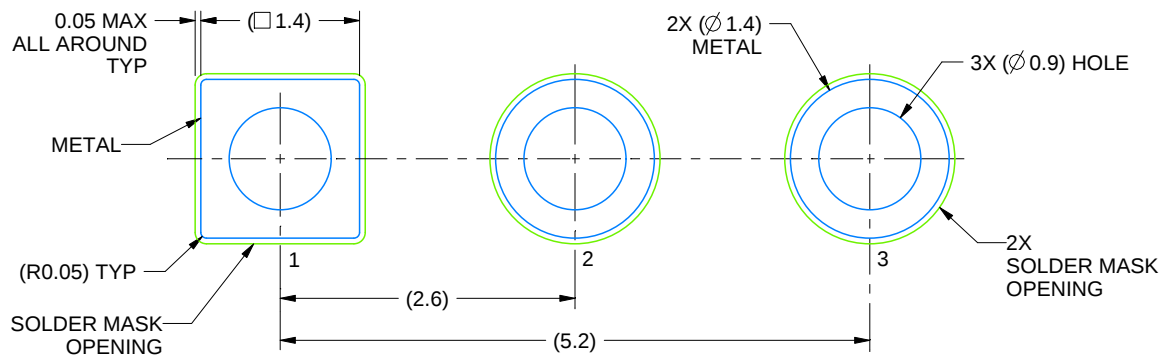
LP0003A

TO-92 - 5.34 mm max height

TO-92



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



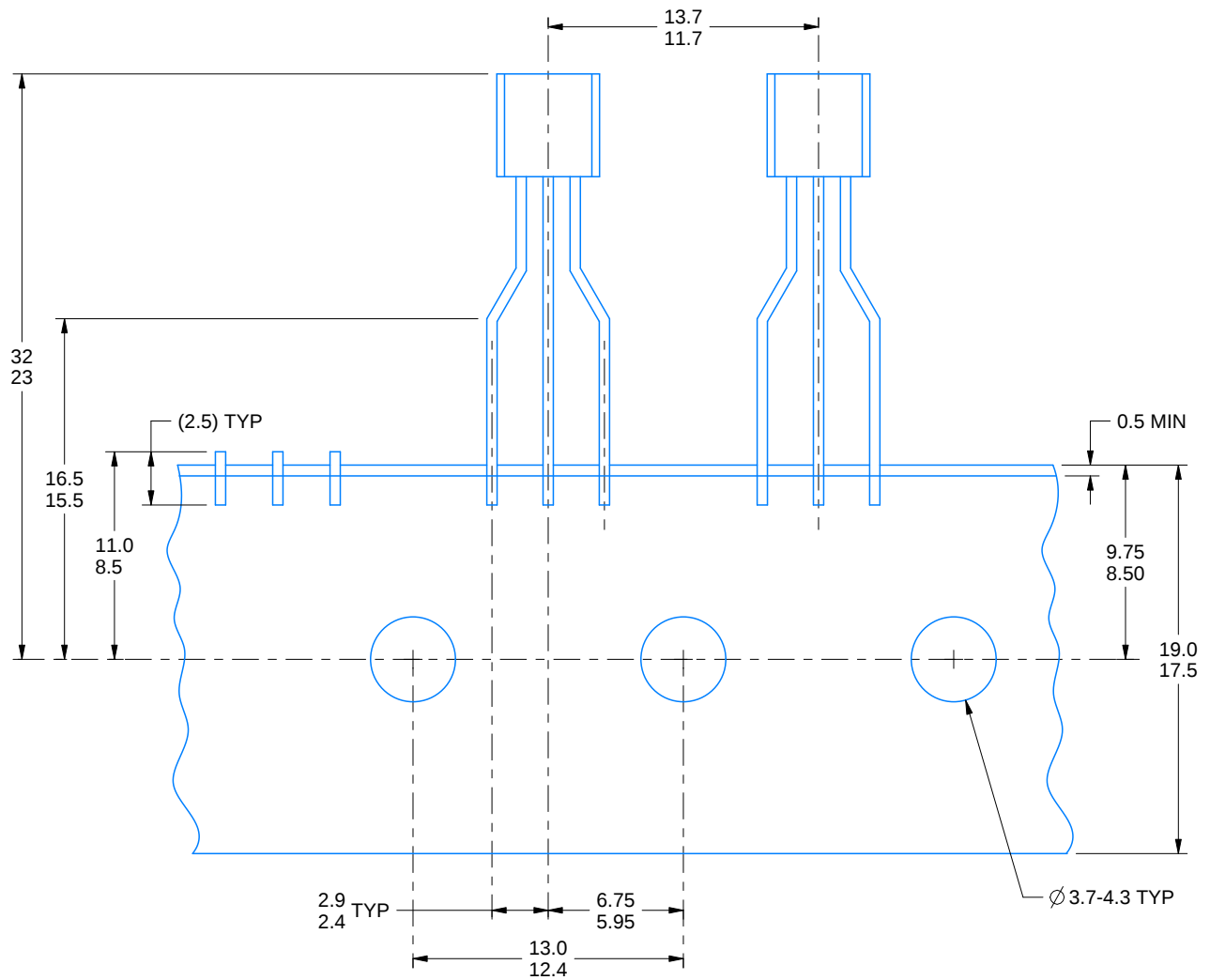
LAND PATTERN EXAMPLE
FORMED LEAD OPTION
NON-SOLDER MASK DEFINED
SCALE:15X

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TO-92 - 5.34 mm max height

TO-92



FOR FORMED LEAD OPTION PACKAGE

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