

January 26, 1987

ULN-3751Z

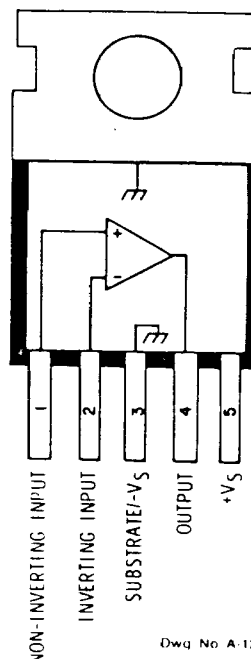
POWER OPERATIONAL AMPLIFIER

FEATURES

- $\pm 3\text{ V}$ to $\pm 13\text{ V}$ Operation
- High Output Swing
- Peak Output Current to $\pm 3.5\text{ A}$
- Low Input Offset
- 90 dB Typical Open-Loop Gain
- Internal Thermal Shutdown
- High Common-Mode Input Range
- Unity Gain Stable
- Pin Compatible with L165, L465, SG1173

A ²**S** COMBINATION general-purpose operational amplifier and power booster, Type ULN-3751Z integrated circuit simplifies circuit design, reduces component count, and enhances system reliability.

This power op amp features high-impedance differential inputs, a unity-gain stable amplifier that needs no external compensation, and a high-current power output. Typical applications include use as voice-coil motor drivers, linear servo amplifiers, power oscillators, bipolar voltage regulators, and audio power drivers.



The ULN-3751Z is for applications demanding up to $\pm 3.5\text{ A}$ of output current. It is furnished in a modified 5-lead JEDEC-style TO-220 plastic package. Lead forming for vertical or horizontal mounting is available (ULN-3751ZV or ULN-3751ZH). The heat sink tab is at substrate potential and must be insulated from ground when the device is used with a split supply.

This power op amp operates over a recommended supply voltage range of $\pm 3\text{ V}$ to $\pm 13\text{ V}$. Dual power op amps are available as the ULN-3755B (16-pin DIP) and the high-power ULN-3755W (12-pin SIP). Both of those devices include output current sensing and a voltage boost connection to maximum output voltage swing to $\pm 20\text{ V}$ supplies at up to $\pm 3.5\text{ A}$ peak output current.

SEMICONDUCTOR GROUP
SPRAGUE ELECTRIC COMPANY

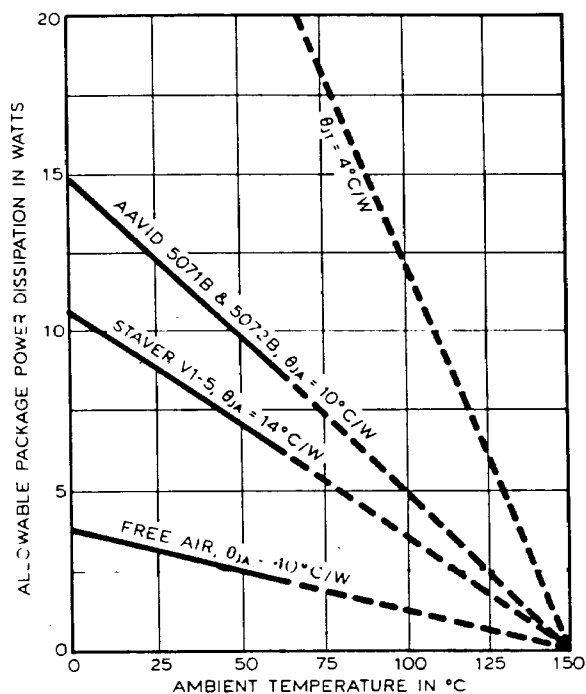
a Unit of The Penn Central Corporation
 115 Northeast Cutoff, Worcester, MA 01606

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ABSOLUTE MAXIMUM RATINGS

at $T_A = +25^\circ\text{C}$

Supply Voltage Differential ($+V_s$ to $-V_s$)	28 V
Peak Output Current, I_{OUT}	± 3.5 A
Input Voltage Range, V_{IN}	$+V_s$ to $-V_s - 0.3$ V
Package Power Dissipation, P_D	See Graph
Operating Temperature Range, T_A	0°C to $+70^\circ\text{C}$
Storage Temperature Range, T_s	-40°C to $+150^\circ\text{C}$

ALLOWABLE POWER DISSIPATION
AS A FUNCTION OF AMBIENT TEMPERATURE

Dwg. No. A-14 249

ELECTRICAL CHARACTERISTICS at $T_A = +25^\circ\text{C}$, $T_{\text{AB}} \leq +70^\circ\text{C}$, $V_S = \pm 6.0\text{ V}$ (unless otherwise noted)

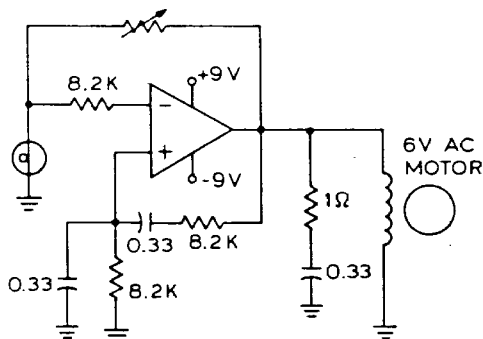
Characteristic	Test Conditions	Limits			
		Min.	Typ.	Max.	Unit
Functional Supply Voltage Range	$+V_S$ to $-V_S$	6.0	—	26	V
Quiescent Supply Current		—	40	60	mA
Input Bias Current	$V_{\text{IN}} = 0$, $I_{\text{OUT}} = 0$	—	-60	-1000	nA
Input Offset Voltage	$V_{\text{IN}} = 0$, $I_{\text{OUT}} = 0$	—	± 2.0	± 10	mV
Input Offset Current	$V_{\text{IN}} = 0$, $I_{\text{OUT}} = 0$	—	10	100	nA
Input Noise Voltage†	BW = 40 Hz to 15 kHz	—	4.0	—	μV
Input Noise Current†	BW = 40 Hz to 15 kHz	—	60	—	pA
Crossover Distortion†	$P_{\text{OUT}} = 50\text{ mW}$, $R_L = 4\ \Omega$	—	<0.05	—	%
Common Mode Rejection	$\Delta V_{\text{CM}} = 2\text{ V}$	60	85	—	dB
Input Common Mode Range†	Positive	—	$+V_S - 2\text{ V}$	—	V
	Negative	—	$-V_S - 0.3\text{ V}$	—	V
Open-Loop Voltage Gain	$f = 0$	80	90	—	dB
Slew Rate	$V_{\text{IN}} = V_{\text{OUT}} = 6\text{ Vpp}$, $R_L = \infty$	1.0	2.3	—	$\text{V}/\mu\text{s}$
Gain-Bandwidth Product†	$A_v = 40\text{ dB}$	—	3.5	—	MHz
Output Voltage Swing	$I_{\text{OUT}} = 1.0\text{ A}$	4.5	4.7	—	V
	$I_{\text{OUT}} = -1\text{ A}$	-4.5	-4.7	—	V
Supply Voltage Rejection	$+V_S$, $\Delta V = 1\text{ V}$	60	85	—	dB
	$-V_S$, $\Delta V = 1\text{ V}$	60	80	—	dB
Thermal Shutdown Temp. †		—	160	—	$^\circ\text{C}$

*This parameter is tested to a lot sample plan only.

†Typical values given for circuit design information only.

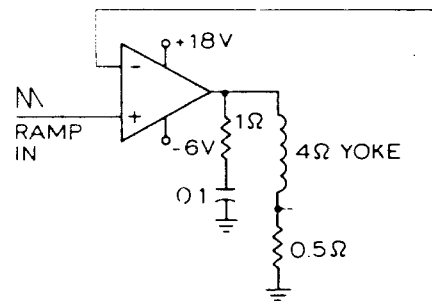
TYPICAL APPLICATIONS

**WIEN BRIDGE
OSCILLATOR/MOTOR DRIVER**



Dwg No A-12.376B

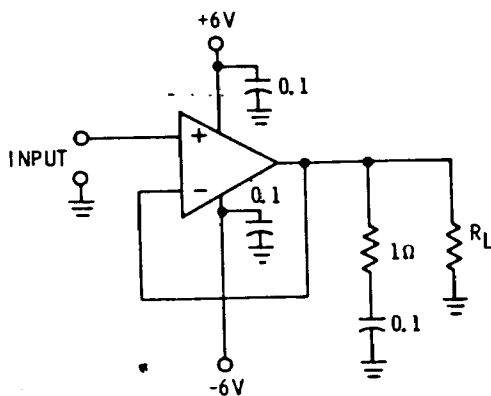
**VIDEO MONITOR
VERTICAL DEFLECTION MAP**



Dwg No A-12.375A

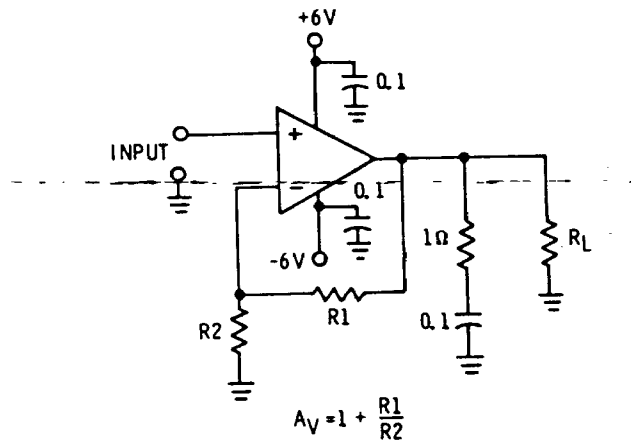
TYPICAL APPLICATIONS

UNITY GAIN VOLTAGE FOLLOWER



Dwg No A-12.551

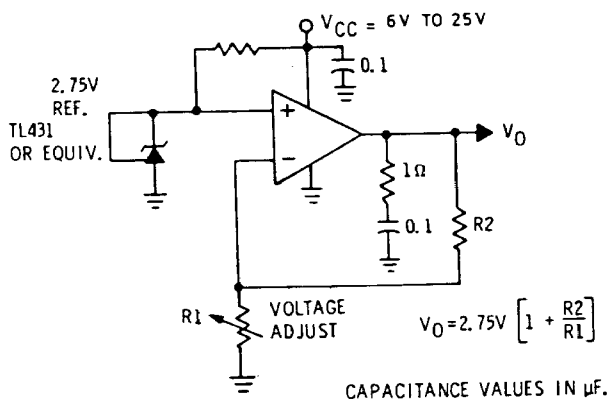
NON-INVERTING POWER AMPLIFIER



$A_V = 1 + \frac{R_1}{R_2}$
CAPACITANCE VALUES IN μF .

Dwg No A-12.552

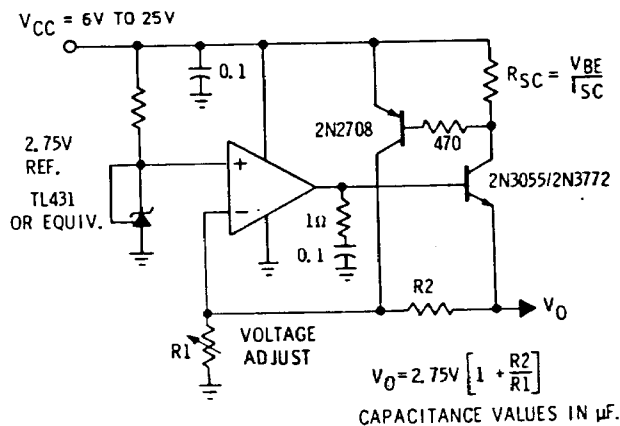
LINEAR VOLTAGE REGULATOR



$V_O = 2.75V \left[1 + \frac{R_2}{R_1} \right]$
CAPACITANCE VALUES IN μF .

Dwg. No. A-12.553A

HIGH-POWER LINEAR REGULATOR
(Short-Circuit Protected)

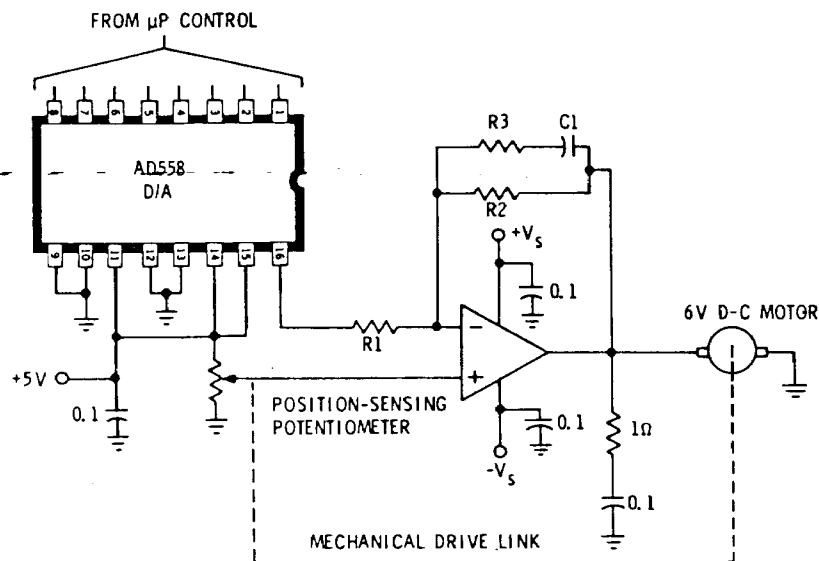


$V_O = 2.75V \left[1 + \frac{R_2}{R_1} \right]$
CAPACITANCE VALUES IN μF .

Dwg No A-12 554B

TYPICAL APPLICATIONS

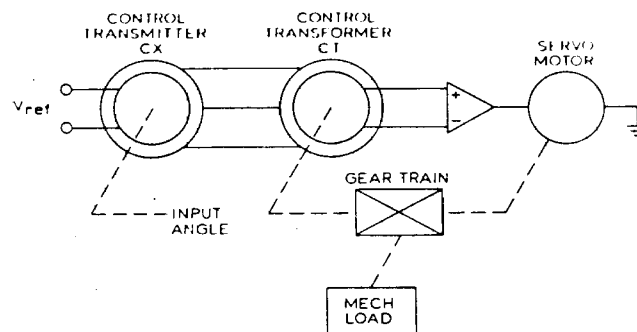
SINGLE-ENDED POSITION SERVO WITH SENSE POTENTIOMETER



R1, R2 DEFINE D-C GAIN.
R3, C1 PICKED TO PROVIDE LOOP COMPENSATION.
CAPACITANCE VALUES IN μF .

Dwg No A-12.556

SIMPLIFIED SERVO APPLICATION WITH CONTROL TRANSFORMERS



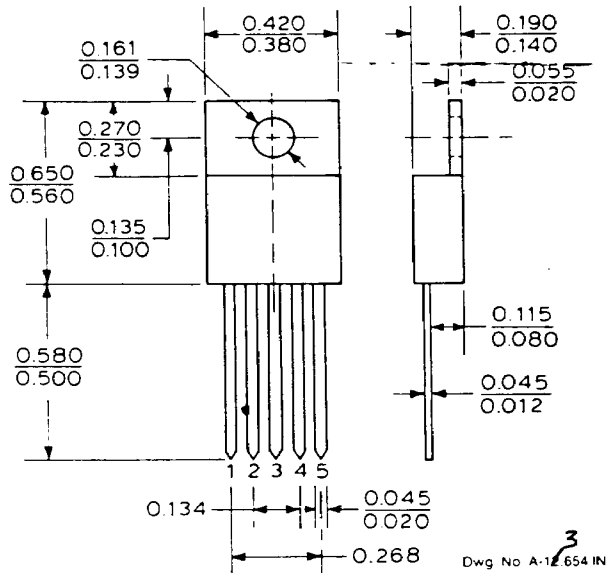
Dwg No A-14.250

PLASTIC SIP

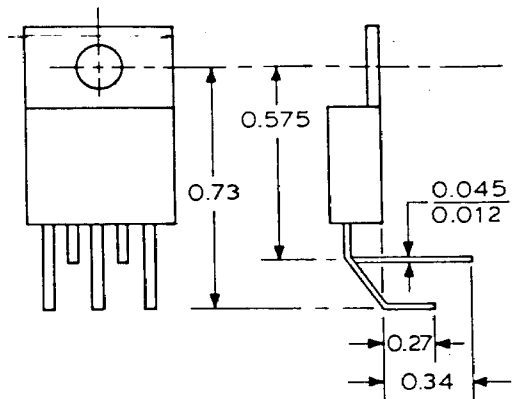
SPRAGUE PACKAGE DESIGNATOR Z, ZH OR ZV

DIMENSIONS IN INCHES

DESIGNATOR Z
(JEDEC Designation TO-220AB)

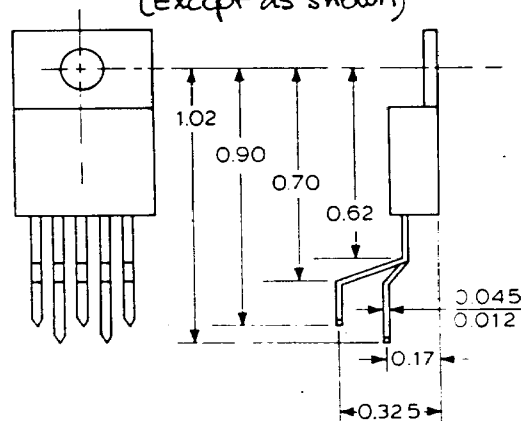


DESIGNATOR ZH
PACKAGE Z
(Except as Shown)



Dwg No A-13 655 IN

DESIGNATOR ZV
PACKAGE Z
(Except as Shown)



Dwg No A-13 656 IN

- A. Dimensions shown as — / — are Min./Max.
- B. Lead thickness is measured at seating plane or below.
- C. Lead spacing tolerance is non-cumulative.
- D. Exact body and lead configuration at vendor's option within limits shown.
- E. Leads missing from their designated positions shall also be counted when numbering leads.
- F. Lead gauge plane is 0.030" (7.62 mm) max. below seating plane.

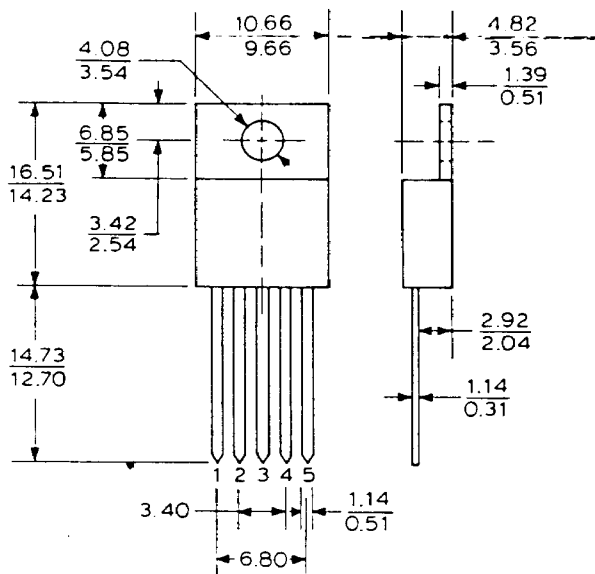
PLASTIC SIP

SPRAGUE PACKAGE DESIGNATOR Z, ZH OR ZV

DIMENSIONS IN MILLIMETERS

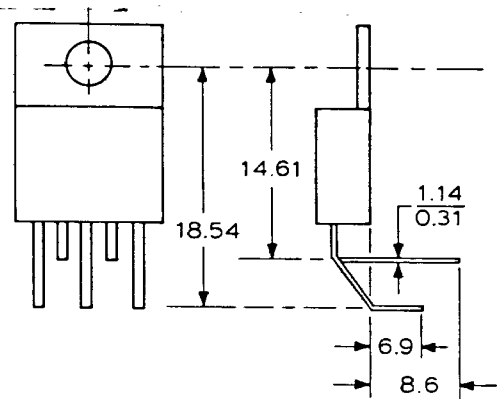
Based on 1" = 25.4 mm

DESIGNATOR Z
(JEDEC Designation TO-220AB)



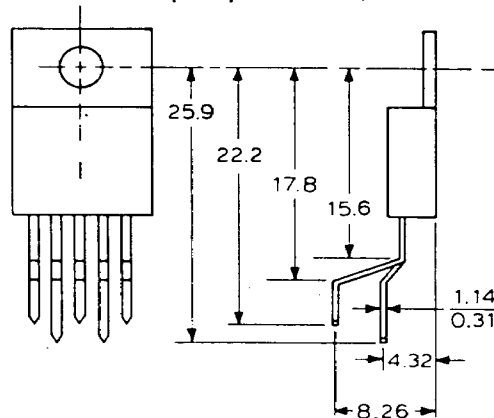
Dwg No A-13 654 MM

DESIGNATOR ZH
PACKAGE Z
(Except as Shown)



Dwg No A-13 655 MM

DESIGNATOR ZV
PACKAGE Z
(Except as Shown)



Dwg No A-13 656 MM

- A. Dimensions shown as — / — are Min./Max.
- B. Lead thickness is measured at seating plane or below.
- C. Lead spacing tolerance is non-cumulative.
- D. Exact body and lead configuration at vendor's option within limits shown.
- E. Leads missing from their designated positions shall also be counted when numbering leads.
- F. Lead gauge plane is 0.030" (7.62 mm) max. below seating plane.

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 TLX 21422

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