SE/NE550-F,L,N

DESCRIPTION

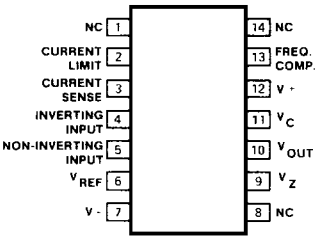
The 550 is a precision monolithic voltage regulator capable of positive or negative supply operation as series, shunt, switching or floating regulator. Guaranteed line regulation is provided for input voltages ranging from 8.5 volts to as high as 50 volts. The output voltage can be continuously adjusted from 2 volts to 40 volts. Foldback current limiting can be accomplished through the use of one external resistor. Internal circuitry permits on and off strobing with DTL and TTL logic inputs and latched shut-down with a pulsed input.

FEATURES

- **Line regulation guaranteed over input voltage range of 8.5 volts to as high as 50 volts.**
- **Output voltage continuously adjustable from 2 volts to 40 volts**
- **.01% line and load regulation**
- **Adjustable limiting of short circuit current**
- **Foldback current limiting with one external resistor**
- **Remote and latching shutdown**
- **Output current up to 150mA without external power transistors**

PIN CONFIGURATIONS

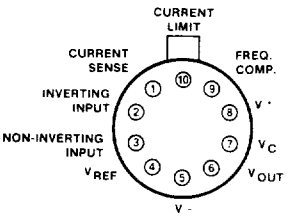
F,N PACKAGE



ORDER PART NO.

SE550F	NE550N
SE550F	NE550F

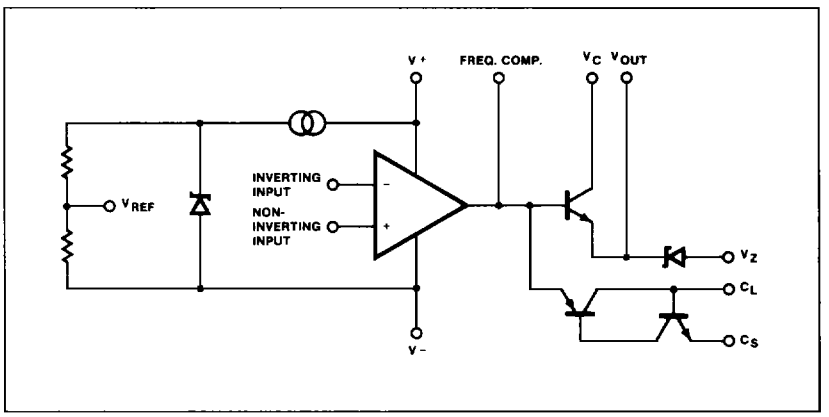
L PACKAGE



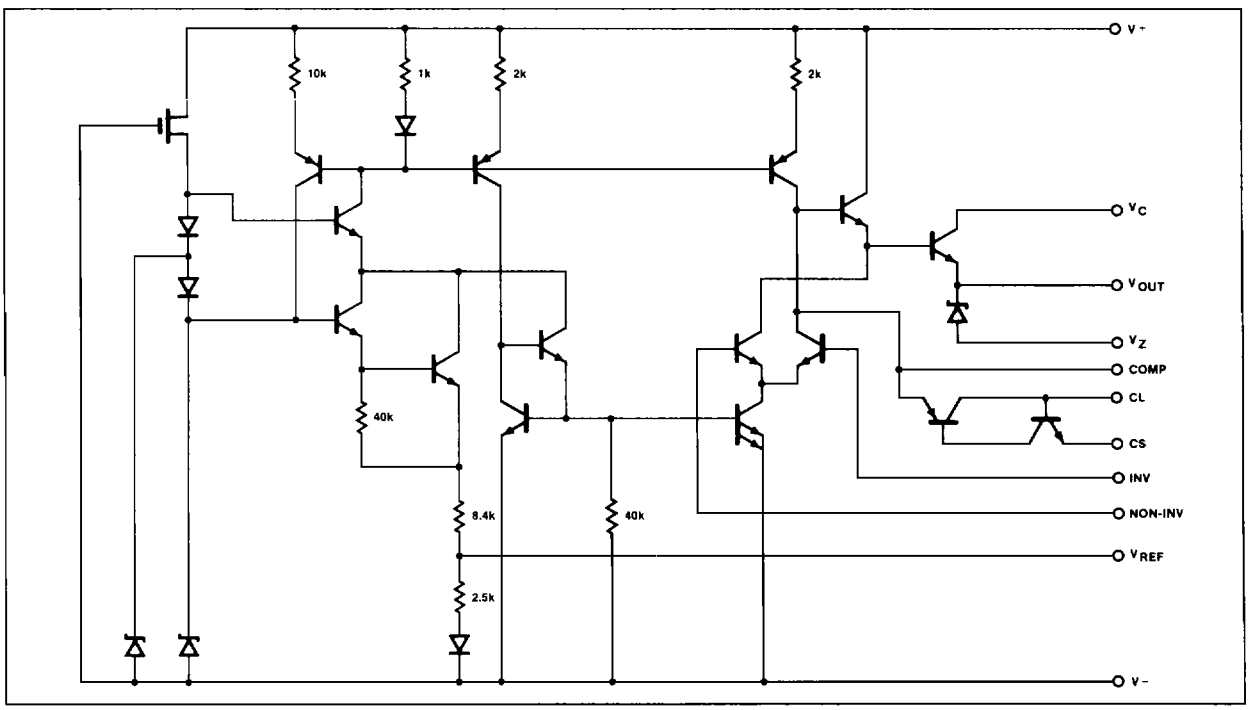
ORDER PART NO.

SE550L	NE550L

CIRCUIT SCHEMATIC



EQUIVALENT CIRCUIT



ABSOLUTE MAXIMUM RATINGS

PARAMETER	RATING	UNIT
Voltage from V+ to V-		
SE550	50	V
NE550	40	V
Input-output voltage differential		
SE550	45	V
NE550	37	V
Maximum output current		
SE550	150	mA
NE550	150	mA
Current from V_Z		
SE550	15	mA
NE550	15	mA
Internal power dissipation[1]		
SE550	800	mW
NE550	800	mW
Operating temperature range		
SE550	-55 to +125	°C
NE550	0 to 70	°C
Storage temperature range		
SE550	-65 to +150	°C
NE550	-65 to +150	°C
Lead temperature		
SE550	300	°C
NE550	300	°C

NOTE

1. Rating applies for case temperatures to 125°C; derate linearly at 6.5mW/°C for ambient termperature above +75°C.

DC ELECTRICAL CHARACTERISTICS $T_A = 25°C$ unless otherwise specified.[1,2]

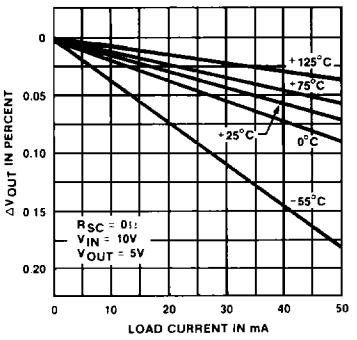
PARAMETER	TEST CONDITIONS	NE550			SE550			UNIT
		Min	Typ	Max	Min	Typ	Max	
Line regulation	V_{IN} = 8.5 to 40V		.08	0.3				$\%V_{OUT}$
	0°C ≤ T_A ≤ 70°C, V_{IN} = 12 to 40V			0.35				$\%V_{OUT}$
	V_{IN} = 12 to 40V					0.05	0.1	$\%V_{OUT}$
	V_{IN} = 8.5 to 50V					0.2	0.6	$\%V_{OUT}$
	-55°C ≤ T_A ≤ +125°C, V_{IN} = 12 to 40V						0.25	$\%V_{OUT}$
Load regulation	I_L = 1mA to 50mA		.03	0.2		0.03	.10	$\%V_{OUT}$
	0°C ≤ T_A ≤ 70°C			0.4				$\%V_{OUT}$
	-55°C ≤ T_A ≤ +125°C						.6	$\%V_{OUT}$
Ripple rejection	f = 50Hz to 10kHz							dB
	C_{REF} = 0		75			75		dB
	C_{REF} = 5μF		90			90		dB
Average temperature coefficient of output voltage	-55° ≤ T_A ≤ +125°C					.002	.012	%/°C
	0°C ≤ T_A ≤ 70°		.002	.015				%/°C
Short circuit limit	RSC = 10Ω, V_{OUT} = 0	50	60	70	50	60	70	mA
Reference voltage		1.58	1.63	1.73	1.58	1.63	1.68	V
Output noise voltage	BW = 100Hz to 10kHz, C_{REF} = 0		20			20		μVrms
	BW = 100Hz to 10kHz, C_{REF} = 5μF		2.5			2.5		μVrms
Long term stability						0.1		%/1000hrs.
Standby current drain	I_L = 0, V_{IN} = 50V					1.3	2.0	mA
	I_L = 0, V_{IN} = 40V		1.6	3.0				mA
Input voltage range		8.5		40	8.5		50	V
Output voltage range		2.0		40	2.0		37	V
Input-output voltage differential		3.0		38	3.0		45	V

NOTES

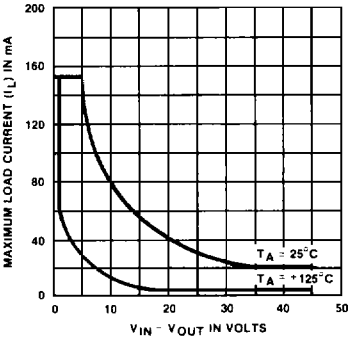
1. V_{IN} = V+ = V_C = 12V, V- = 0V, V_{OUT} = 5V, I_L = 1mA, R_{SC} = 0, CI = 100pF, and divider impedance as seen by error amplifier = 2kΩ.
2. The load and line regulation specifications are for constant temperature junction. Temperature drift effects must be taken into account separately when the unit is operating under conditions of high or varying dissipation.

TYPICAL PERFORMANCE CHARACTERISTICS

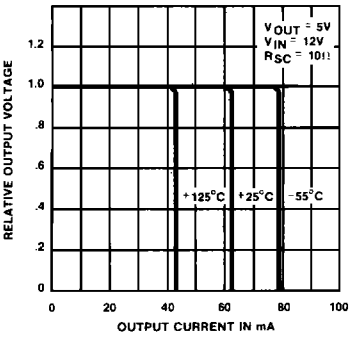
LOAD REGULATION AS A FUNCTION OF LOAD CURRENT



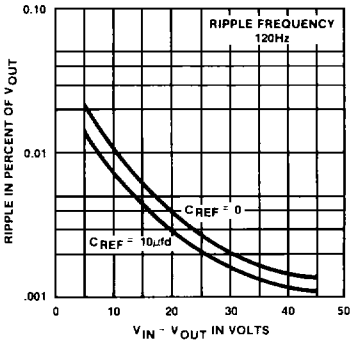
MAXIMUM LOAD CURRENT AS A FUNCTION OF INPUT-OUTPUT VOLTAGE DIFFERENTIAL



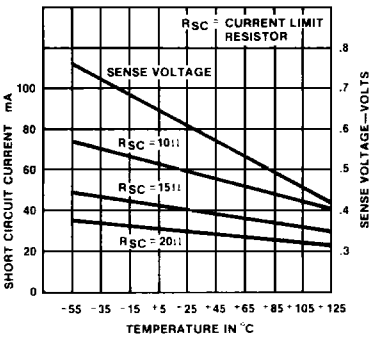
RELATIVE OUTPUT VOLTAGE AS A FUNCTION OF LIMITED OUTPUT CURRENT



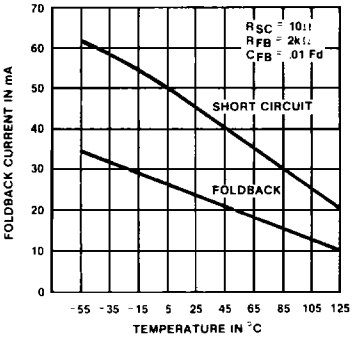
RIPPLE REJECTION AS A FUNCTION OF INPUT-OUTPUT VOLTAGE DIFFERENTIAL



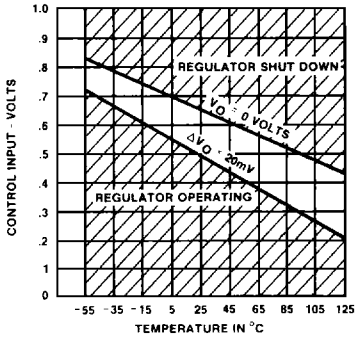
SENSE VOLTAGE AND SHORT CIRCUIT CURRENT LIMIT AS A FUNCTION OF TEMPERATURE



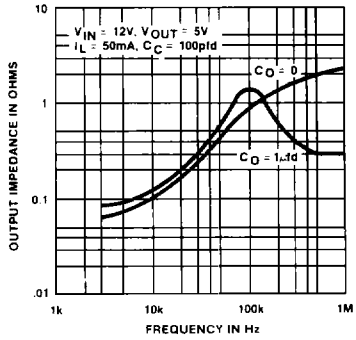
SHORT CIRCUIT AND FOLDBACK CURRENTS AS A FUNCTION OF TEMPERATURE



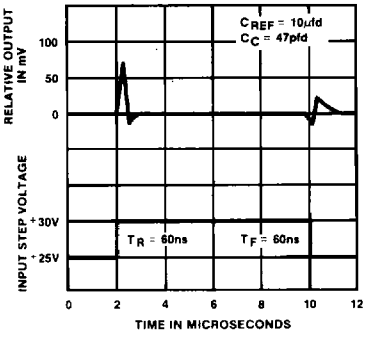
REMOTE CONTROL CHARACTERISTICS AS A FUNCTION OF TEMPERATURE



OUTPUT IMPEDANCE AS A FUNCTION OF FREQUENCY

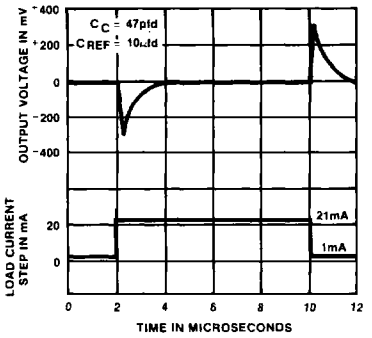


LINE TRANSIENT RESPONSE

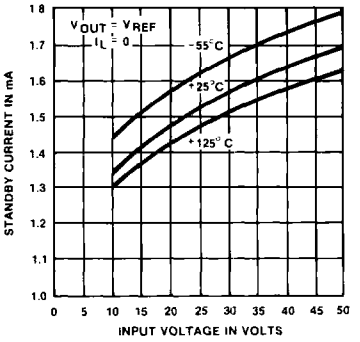


TYPICAL PERFORMANCE CHARACTERISTICS (Cont'd)

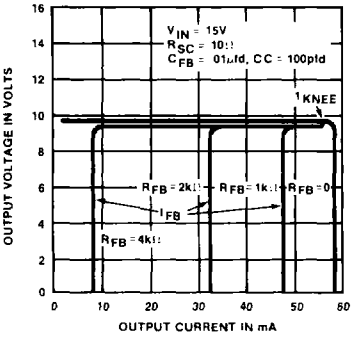
LOAD TRANSIENT RESPONSE



STANDBY CURRENT AS A FUNCTION OF INPUT VOLTAGE

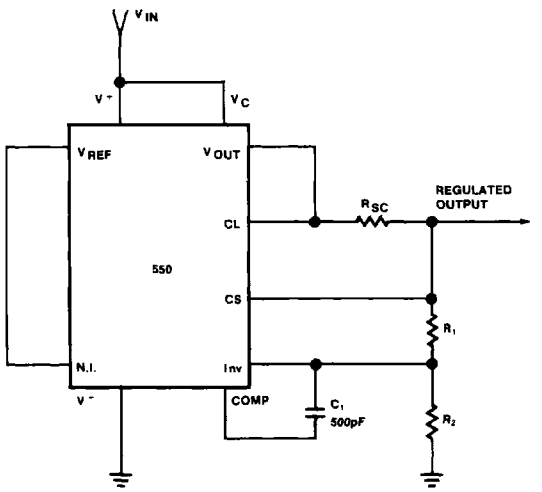


FOLDBACK CURRENT LIMITED OUTPUT VOLTAGE AS A FUNCTION OF OUTPUT CURRENT



TYPICAL APPLICATIONS

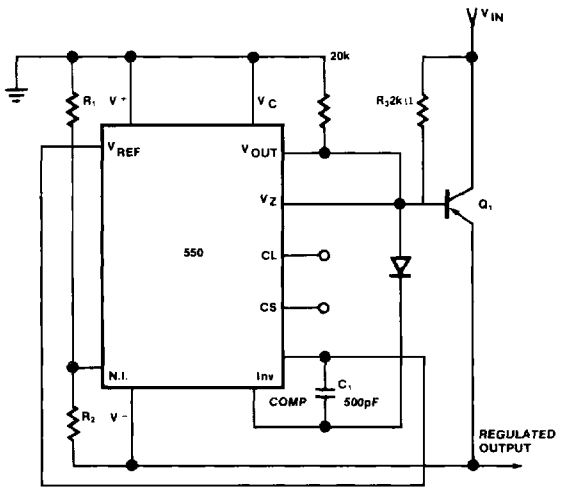
BASIC POSITIVE VOLTAGE REGULATOR



$$V_{OUT} = V_{REF}\frac{R_1 + R_2}{R_2} \quad ISC = \frac{V_{SENSE}}{RSC}$$

$$\frac{R_1R_2}{R_1 + R_2} = 2k\Omega \text{ for minimum temperature drift}$$

NEGATIVE VOLTAGE REGULATOR



$$V_{OUT} = -V_{REF}x\frac{R_1 + R_2}{R_2}$$

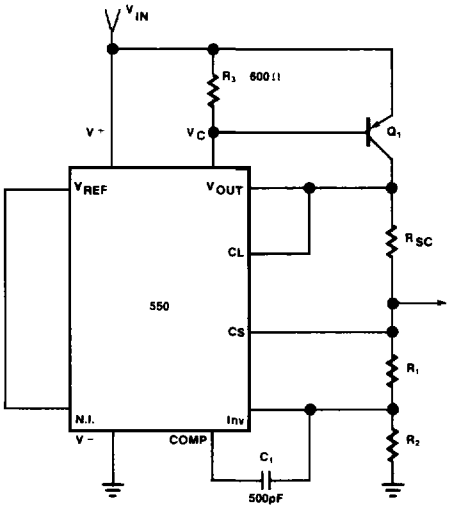
$$\frac{R_1R_2}{R_1 + R_2} = 2k\Omega \text{ for minimum temperature drift}$$

NOTE

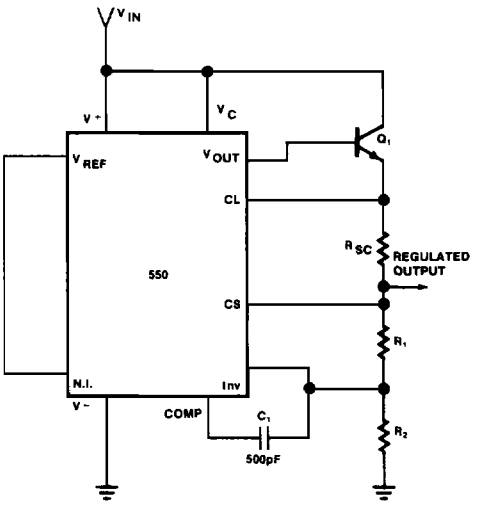
To utilize the SE550L in applications which require Vz, an external 6.2 volt zener diode should be connected in series with V_{OUT}.

TYPICAL APPLICATIONS (Cont'd)

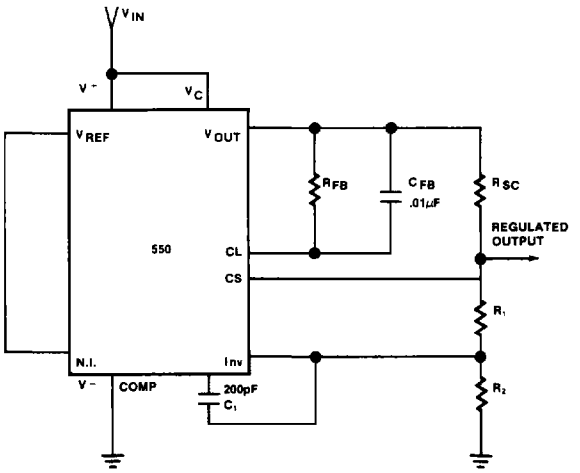
POSITIVE VOLTAGE REGULATOR (External PNP Pass Transistor)



POSITIVE VOLTAGE REGULATOR (External NPN Pass Transistor)



FOLDBACK CURRENT LIMITED REGULATOR

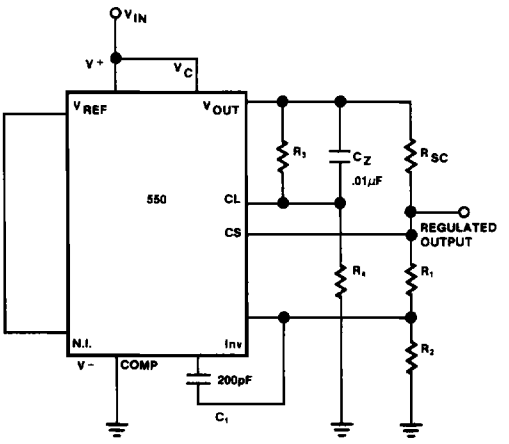


$$I_{KNEE} = \frac{V_{SENSE}}{R_{SC}}$$

$$I_{FB} = \frac{V_{SENSE} - (R_{FB} - I_{CL})}{R_{SC}}$$

$I_{CL} = 125\mu A$

SECOND ORDER FOLDBACK CURRENT LIMITED REGULATOR



$$R_3 = \frac{V_{SENSE}\,(I_{KNEE} - I_{FB})\,V_{OUT}}{I_{CL}\,(I_{KNEE} - I_{FB} + I_{SC})\,V_{OUT} - (I_{FB} - I_{SC})\,V_{SENSE}}$$

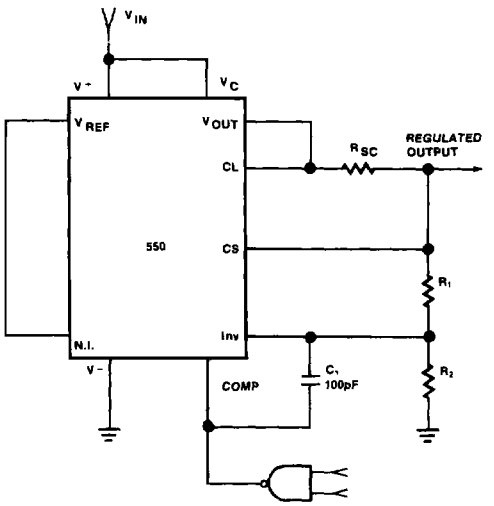
$$\frac{R_3}{R_4} = \frac{(V_{SENSE} - I_{CL}\,R_3)\,(I_{FB} - I_{SC})}{V_{OUT}\,I_{SC} - V_{SENSE}\,(I_{FB} - I_{SC})}$$

$$R_{SC} = \frac{(V_{OUT} + V_{SENSE})\,R_3/R_4 + V_{SENSE}}{I_{KNEE}}$$

$I_{CL} = 125\mu A$

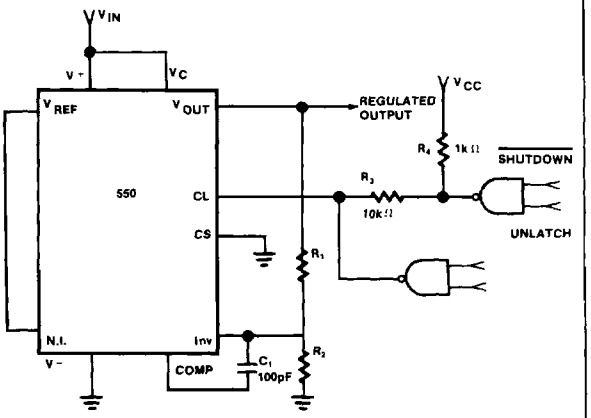
TYPICAL APPLICATIONS (Cont'd)

REMOTE SHUTDOWN REGULATOR WITH CURRENT LIMITING



1/4 8T80, 1/6 8T90, 1/10 8TO1B, etc.

REMOTE LATCHING SHUTDOWN REGULATOR

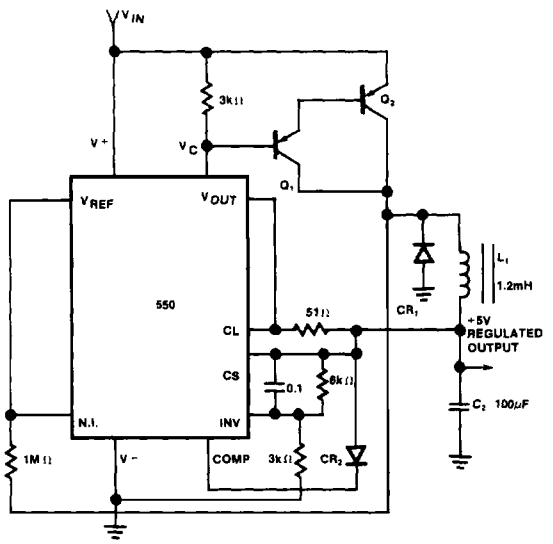


8415, 8417, 2/3 8471, 1/3 8891, 8T90, 1/2 8481, 8881, 8T90

NOTE

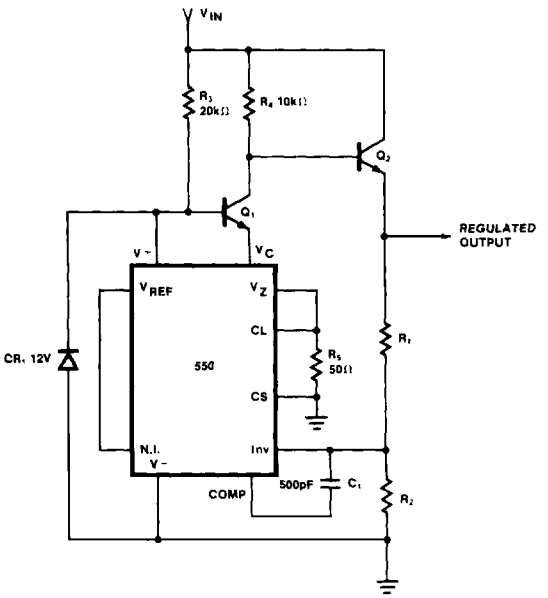
The "Shut-down" gate need only be pulsed to latch the regulator output to zero. R4 may omitted for active pull-up devices. The "Unlatch" gate must have an open collector.

POSITIVE SWITCHING REGULATOR



L_1 is 50 turns of #22 wire wound on Ferroxcube. 42/29-377 A400

POSITIVE FLOATING REGULATOR



TYPICAL APPLICATIONS (Cont'd)

NEGATIVE FLOATING REGULATOR