MICROPOWER OPERATIONAL AMPLIFIER 533

LINEAR INTEGRATED CIRCUITS

DESCRIPTION

The 533 is a high performance operational amplifier specifically designed for applications requiring low power consumption or reduced supply voltage. The 533 features single capacitor compensation, input and output protection and is pin compatible with the μA709, μA748, and LM101.

FEATURES

- LESS THAN 100μW POWER DISSIPATION
- LOW INPUT OFFSET VOLTAGE
- LOW INPUT BIAS AND OFFSET CURRENTS
- HIGH COMMON MODE AND POWER SUPPLY REJECTION RATIOS
- EXCELLENT TEMPERATURE STABILITY
- NO LATCH UP

ABSOLUTE MAXIMUM RATINGS

Supply Voltage		±18V
Differential Input Voltage		±5V
Input Voltage		$\pm V_S$
Operating Temperature Range	SE533	-55°C to +125°C
	NE533	0°C to 70°C
Lead Temperature (Solder, 60 sec)		300°C
Output Short Circuit Duration (Note 1)		Indefinite

1. Short circuit may be to ground or either supply. Rating applies to +125°C case temperature or +75°C ambient temperature.

PULSE RESPONSE TEST CIRCUIT

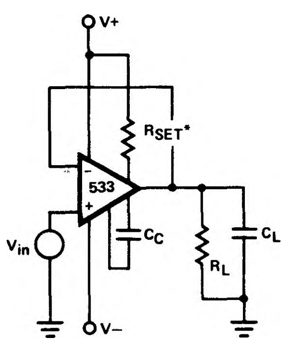
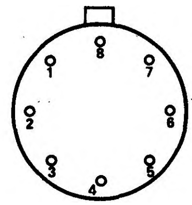


FIGURE 1

PIN CONFIGURATION

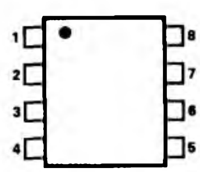
T PACKAGE
(Top View)



1. Compensation
2. Inverting Input
3. Noninverting Input
4. V^-
5. Compensation
6. Output
7. V^+
8. R_{SET}

ORDER PART NOS.
SE533T/NE533T

V PACKAGE
(Top View)



1. Compensation
2. Inverting Input
3. Noninverting Input
4. V^-
5. Compensation
6. Output
7. V^+
8. R_{SET}

ORDER PART NOS.
SE533V/NE533V

NOTE:
R_{SET} establishes internal biasing of the amplifier to allow for a wide range of supply voltages. Recommended values of R_{SET} are 3.9mΩ at V_s = ±3V or 15mΩ at V_s = ±15V. Consult graphs for intermediate values.

ELECTRICAL CHARACTERISTICS (NOTE 1)

PARAMETER	CONDITIONS	NE533 MIN.	NE533 TYP.	NE533 MAX.	SE533 MIN.	SE533 TYP.	SE533 MAX.	UNITS
Input Offset Voltage	V_S = ±3V, and ±15, R_S = 100KΩ			3			2	mV
Input Offset Voltage	V_S = ±3V,and ±15V, R_S=100K,T_A=25℃		1	2		0.5	1	mV
Input Bias Current	V_S = ±3V, and ±15V			30			30	nA
Input Bias Current	V_S = ±3V, and ±15V, T_A = 25°C		5	10		2	10	nA
Input Offset Current	V_S = ±3V, and ±15V			10			10	nA
Input Offset Current	V_S = ±3V,and ±15V, T_A = 25 °C		1	5		0.5	5	nA
Input Resistance	V_S = ±3V, and ±15V	15			15			mΩ
Input Resistance	V_S = ±3V,and ±15V, T_A = 25°C	30	60		30	60		mΩ
Input Voltage Range	V_S = ±3V	±1.50			±1.50			V
Input Voltage Range	V_S = ±15V	±10			±10			V
Large Signal Voltage Gain	V_S = ±3V, R_L ⩾20kΩ, V_{out} = ±1.0V	10			10			V/mV
Large Signal Voltage Gain	V_S = ±3V, R_L ⩾20kΩ, V_{out} = ±1.0V, T_A = 25°C	12	15		16	20		V/mV
Large Signal Voltage Gain	V_S = ±15V, R_L ⩾50kΩ, V_{out} = ±10V	25			25			V/mV
Large Signal Voltage Gain	V_S = ±15V, R_L ⩾50kΩ, V_{out} = ±10V, T_A = 25°C	40	60		50	70		V/mV
Output Short Circuit Current	V_S = ±3V, ±15V, T_A = 25 °C		6			6		mA
Common Mode Rejection Ratio	V_S = ±3V, R_S ⩽ 100kΩ	74			80			dB
Common Mode Rejection Ratio	V_S = ±3V, R_S ⩽ 100kΩ, T_A = 25°C	84	105		90	100		dB
Common Mode Rejection Ratio	V_S = ±15V, R_S ⩽ 100kΩ	84			80			dB
Common Mode Rejection Ratio	V_S = ±15V, R_S ⩽ 100kΩ, T_A = 25°C	90	110		100	120		dB
Power Supply Rejection Ratio	V_S = ±3V to ±15V, R_S ⩽ 100k Ω			100			50	µV/V
Power Supply Rejection Ratio	V_S = ±3V to ±15V,R_S ⩽ 100kΩ,T_A=25℃ T_A = 25°C		20	50		10	25	µV/V
Supply Current	V_S = ±3V V_O= OV			20			16	µA
Supply Current	V_S = ±15V V_O= OV			50			30	µA
Power Dissipation	V_S = ±3V V_O= OV			120			96	µW
Power Dissipation	V_S = ±15V V_O= OV			1.5			0.9	mW

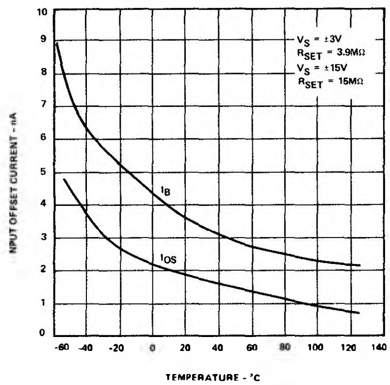
TRANSIENT RESPONSE (See Figure 1)

PARAMETER	CONDITIONS	NE533 MIN.	NE533 TYP.	NE533 MAX.	SE533 MIN.	SE533 TYP.	SE533 MAX.	UNITS
Rise Time	V_S = ±3V, R_L = 20k, C_L = 100pF		2			2		µsec
Overshoot	V_{in} = 10mV, C_C= 0.05µf		10			10		%
Slew Rate	T_A = 25°C		5			5		mV/µsec
Rise Time	V_S = ±15V, R_L = 50k, C_C = 100pF		1			1		µsec
Overshoot	V_{in} = 20V, C_C = 0.05µf		10			10		%
Slew Rate	T_A = 25°C		30			30		mV/µsec

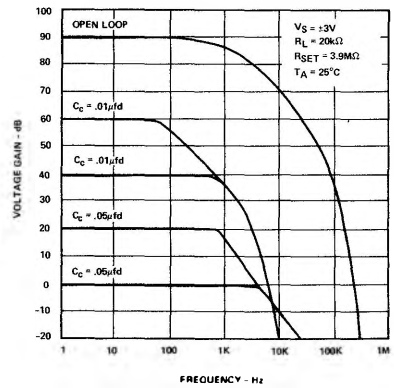
NOTE 1: Specifications apply for the full temperature range unless otherwise stated. For V_S = ±3V, R_{set} = 3.9mΩ; for V_S = ±15V, R_{set} = 15mΩ

TYPICAL CHARACTERISTIC CURVES

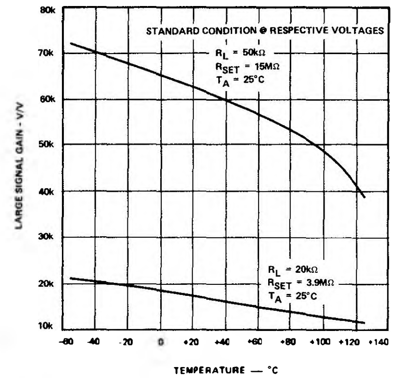
INPUT BIAS AND OFFSET CURRENTS AS FUNCTIONS OF AMBIENT TEMPERATURE



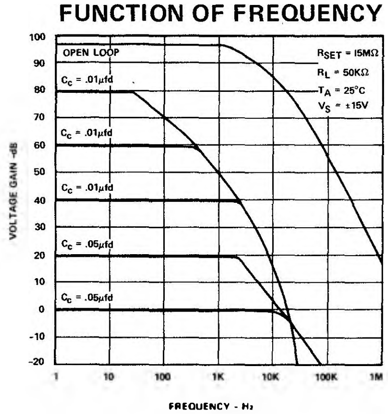
VOLTAGE GAIN AS A FUNCTION OF FREQUENCY



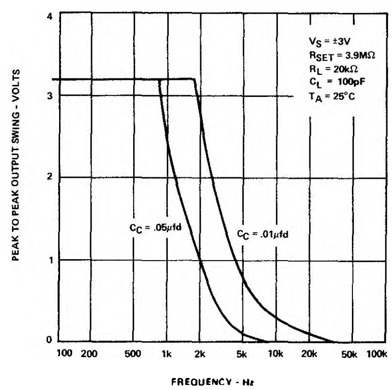
LARGE SIGNAL OPEN LOOP VOLTAGE GAIN AS A FUNCTION OF AMBIENT TEMPERATURE



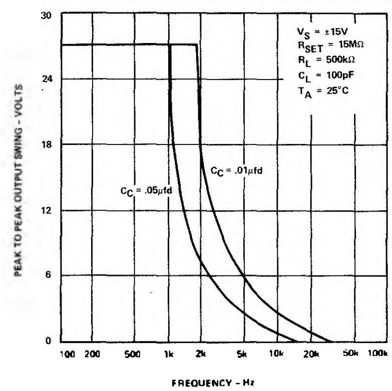
VOLTAGE GAIN AS A FUNCTION OF FREQUENCY



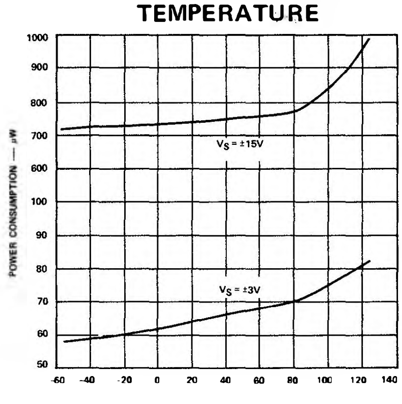
OUTPUT VOLTAGE SWING AS A FUNCTION OF FREQUENCY



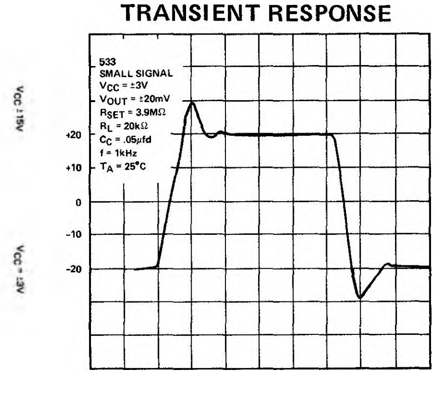
OUTPUT VOLTAGE SWING AS A FUNCTION OF FREQUENCY



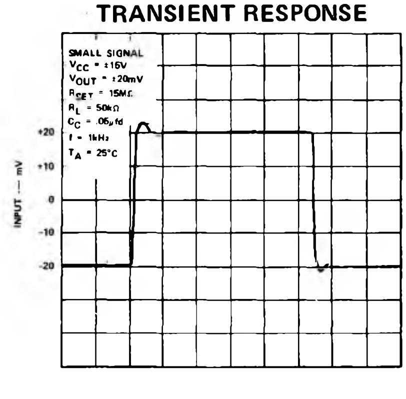
POWER CONSUMPTION AS A FUNCTION OF AMBIENT TEMPERATURE



SMALL SIGNAL UNITY GAIN TRANSIENT RESPONSE

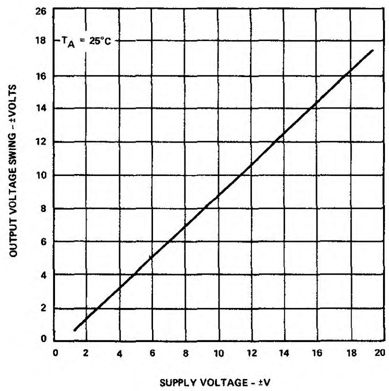


SMALL SIGNAL UNIT GAIN TRANSIENT RESPONSE

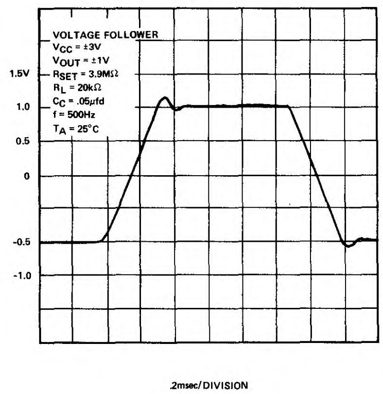


TYPICAL CHARACTERISTIC CURVES (Cont'd.)

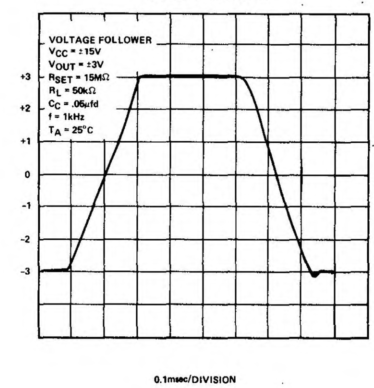
OUTPUT VOLTAGE SWING AS A FUNCTION OF SUPPLY VOLTAGE



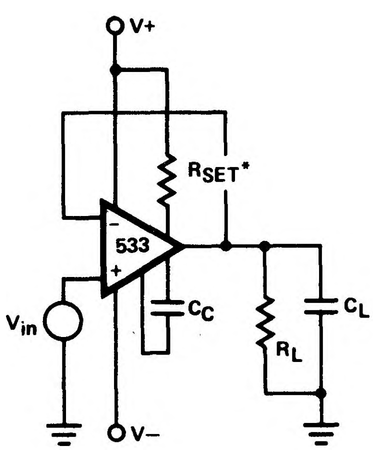
UNITY GAIN VOLTAGE FOLLOWER LARGE SIGNAL RESPONSE



UNITY GAIN VOLTAGE FOLLOWER LARGE SIGNAL RESPONSE



TYPICAL APPLICATIONS



RECOMMENDED VALUES OF R_{SET} FOR INTERMEDIATE SUPPLY VOLTAGES