OPERATIONAL AMPLIFIER — HIGH-VOLTAGE, VERY-HIGH-POWER

FEATURES

- **High-Output Current Guaranteed.....±10A (Peak)**
- **Unity-Gain Stable**
- **Gain-Bandwidth Product (Single-Pole Rolloff) .....4 MHz**
- **Slew Rate.....5V/µs**
- **Voltage Supplies .....±10V to ±50V**
- **Pin/Performance Compatible with PA-12, OPA512**

APPLICATIONS

- **Motor Drives**
- **Magnetic Deflection Circuits**
- **Programmable Power Supplies**
- **High-Power Servo Amplifiers**
- **Audio Amplifiers (to 120W rms)**

GENERAL DESCRIPTION

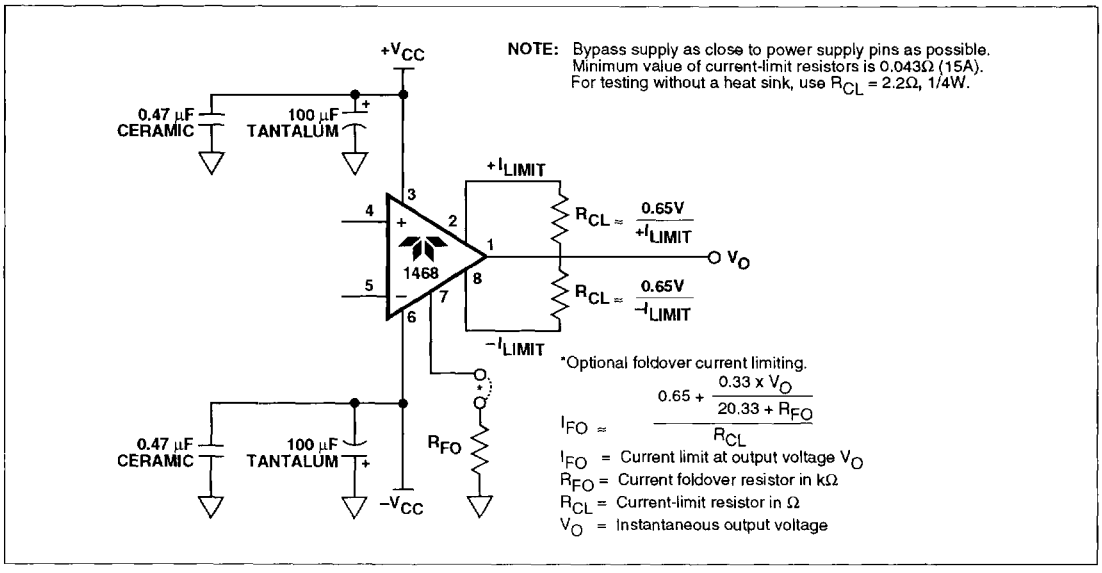
The 1468 is a high-voltage, very-high-power operational amplifier. It can operate over a wide range of supply voltages (±10V to ±50V) and has a guaranteed minimum output current of ±10A (peak). The output stage is biased Class AB for low crossover distortion and optimum linearity. It is also protected against back-EMF which is encountered when driving inductive loads, such as motors or solenoids.

With an 8Ω load, the 1468's open-loop gain is 96 dB minimum, 108 dB typical. Input offset voltage is ±2 mV and input bias current is 12 nA. The 1468 is internally compensated for unity gain and delivers excellent dynamic performance for a device of this type. Slew rate is a fast 5V/µs and unity-gain bandwidth is an impressive 4 MHz.

The 1468 is housed in an 8-pin TO-3 can. The standard product is specified for –25°C to +85°C operation. The 1468 High Reliability (HR) version is specified for –55°C to +125°C operation.

9

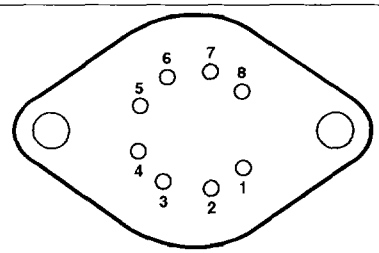
STANDARD CONFIGURATION



1468 (TCPA12)

PIN CONFIGURATION

PIN NO.	DESIGNATION
1	OUTPUT
2	$+I_{LIMIT}$
3	$+V_{CC}$
4	+INPUT
5	–INPUT
6	$-V_{CC}$
7	FOLDOVER
8	$-I_{LIMIT}$



BOTTOM VIEW

ABSOLUTE MAXIMUM RATINGS

V_{CC} Supply Voltage ..... ±50V
V_{ID} Differential Input Voltage ..... ±($|V_{CC}|$–3V)
V_{ICM} Common-Mode Input Voltage ..... $\pm V_{CC}$
I_O Output Current ..... ±15A
P_D Internal Power Dissipation 125W
T_C Operating Temperature Range (Case)
1468 ..... –25°C to +85°C
1468-HR ..... –55°C to +125°C
T_{STG} Storage Temperature Range ..... –65°C to +150°C
T_J Junction Temperature
(Output Transistor) (Note 1) ..... +200°C
θ_{JC} Junction-to-Case Thermal Resistance
(Output Transistor) (Note 2) ..... 0.9°C/W @ AC
1.4°C/W @ DC

NOTES: 1. Prolonged operation at maximum junction temperature will result in reduced product life. Derate internal power dissipation to achieve high MTBF.
2. AC rating applies if the output current alternates between both output transistors at a rate greater than 60 Hz.

DC CHARACTERISTICS: (Note 1) V_{CC} = ±40V, R_L = 1 kΩ, T_C = 25°C, unless otherwise noted.

Symbol	Parameter	Test Conditions	1468 Min	1468 Typ	1468 Max	1468-HR Min	1468-HR Typ	1468-HR Max	Unit
V_{OS}	Input Offset Voltage		—	±2	**±6**	—	±2	**±6**	mV
V_{OS} TC	Input Offset Voltage Drift vs Temperature	Average, T_{MIN} to T_{MAX}	—	±10	—	—	±10	**±65**	µV/°C
I_B	Input Bias Current		—	±12	**±30**	—	±12	**±30**	nA
I_B TC	Input Bias Current Drift vs Temperature	Average, T_{MIN} to T_{MAX}	—	±50	—	—	±50	**±400**	pA/°C
I_{OS}	Input Offset Current		—	±12	**±30**	—	±12	**±30**	nA
I_{OS} TC	Input Offset Current Drift vs Temperature	Average, T_{MIN} to T_{MAX}	—	±50	—	—	±50	**±400**	pA/°C
A_{VOL}	Open-Loop Voltage Gain		—	110	—	—	110	—	dB
		R_L = 8Ω	**96**	108	—	**96**	108	—	dB
PSRR	Power Supply Rejection Ratio		**74**	90	—	**74**	90	—	dB
CMRR	Common-Mode Rejection Ratio	V_{CM} = ±33V	**74**	100	—	**74**	100	—	dB
CMR	Common-Mode Range (DC Linear Operation)	CMRR ≥ 68 dB	**±35**	±37	—	**±35**	±37	—	V
Z_{ID}	Differential Input Impedance		—	200MII3	—	—	200MII3	—	ΩIIpF
V_O	Output Voltage Swing	I_{OUT} = 5A	**±35**	—	—	**±35**	—	—	V
		I_{OUT} = 10A	**±34**	—	—	**±34**	—	—	V
I_O	Output Current	Peak	**±10**	—	—	**±10**	—	—	A
I_{SC}	Output Short-Circuit Current	Note 2	—	—	—	—	—	—	A
R_O	Output Resistance (DC Open-Loop)		—	2	—	—	2	—	Ω
V_{CC}	Supply Voltage Range (Operating)		±10	±40	±45	±10	±40	±45	V
I_{CC}	Quiescent Supply Current		—	±25	**±50**	—	±25	**±50**	mA

NOTES: 1. Limits printed in **boldface** type are guaranteed and 100% production tested. Limits in normal font are guaranteed but not 100% production tested.
2. Current limiting is set by user via external resistors.

AC CHARACTERISTICS: (Note 1) V_{CC} = ±40V, R_L = 1 kΩ, T_C = 25°C, unless otherwise noted.

Symbol	Parameter	Test Conditions	1468 Min	1468 Typ	1468 Max	1468-HR Min	1468-HR Typ	1468-HR Max	Unit
S_R	Slew Rate		2.5	5	—	2.5	5	—	V/µs
GBWP	Gain-Bandwidth Product	f = 1 MHz, R_L = 8Ω	—	4	—	—	4	—	MHz
UGBW	Unity-Gain Bandwidth		—	4	—	—	4	—	MHz
t_s	Settling Time (A_{CL} = -1)	2V step/0.1%	—	2	—	—	2	—	µs
e_n	Input Voltage Noise Density	f = 1 kHz	—	16	—	—	16	—	nV/√Hz
i_n	Input Current Noise Density	f = 1 kHz	—	0.18	—	—	0.18	—	pA/√Hz
C_L	Capacitive Load (Maximum w/o oscillation)	A_{CL} = +1	1500	—	SOA	1500	—	SOA	pF

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Output Current Limiting

The 1468 output can be current limited using the $\pm I_{LIMIT}$ formulas shown in the standard configuration diagram. In some applications, foldover current limiting can be used to allow increased output current as the 1468 output approaches the power supply rail voltage. To calculate the foldover current limit, use the formula for I_{FO} shown in the diagram. The following procedures should be followed:

1. Calculate a value for R_{CL} that provides a safe current limit at V_O = 0V.
2. Calculate the maximum value of I_{FO}* by using a value of 0Ω for R_{FO}. This is the maximum current limit possible using the foldover current-limit option.
3. Calculate a value for R_{FO} using the value for R_{CL} calculated in step 1, and a desired I_{FO} limit which is lower than the maximum limit calculated in step 2.

*This calculation assumes the output voltage (V_O) is the same polarity as the current carrying supply voltage. If not, invert the polarity of V_O before making this calculation.

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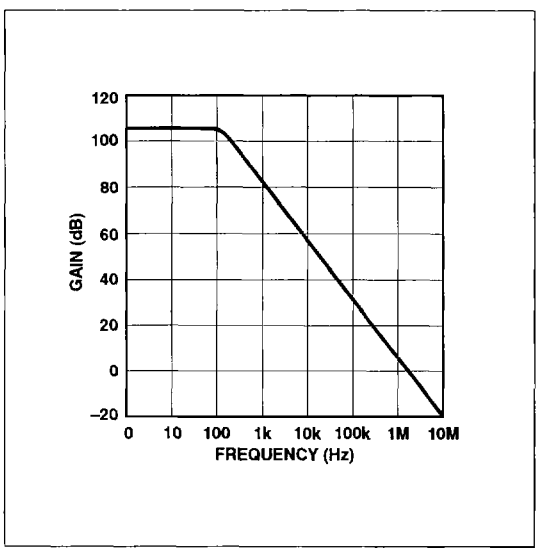

Figure 1. Bode Plot

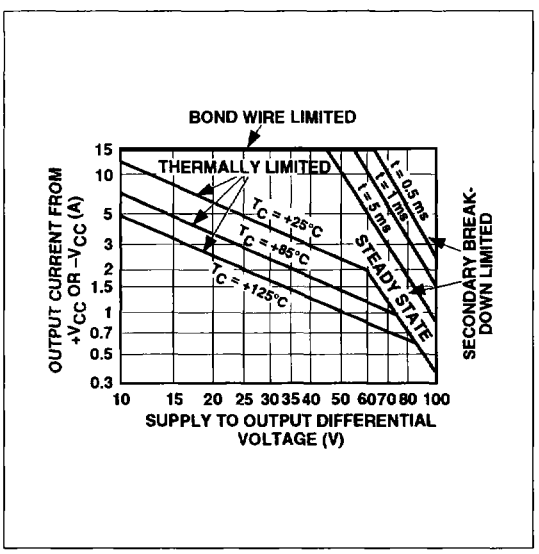

Figure 2. Safe Operating Area (SOA)