

MITSUBISHI LINEAR ICs  
**M51544AL**

**DUAL PREAMPLIFIER WITH ALC**

**DESCRIPTION**

The M51544AL is a semiconductor integrated circuit designed for use as a preamplifier in stereo radio cassette recorders and tape recorders, and housed in a compact 10-pin SIL package.

It consists of two high-gain, low-distortion amplifiers and ALC circuit, and can be used as stereo preamplifiers offering good channel balance.

**FEATURES**

- Low noise ....  $V_{NI} = 1\mu\text{Vrms}$  ( $R_g = 620\Omega$ ,  $BW = 20\text{Hz} \sim 20\text{kHz}$ )
- High gain .....  $G_{VO} = 80\text{dB}$  (typ)
- Low distortion .....  $\text{THD} = 0.1\%$  (typ) ( $G_{VC} = 46\text{dB}$ ,  $V_O = 0.3\text{Vrms}$ )
- Well-balanced ALC circuit .....  $\Delta V_{OALC} = 0\text{dB}$  (typ)
- Low power consumption .....  $6\text{mA}$  (typ)
- Built-in circuit to reduce shock-noise when power supply is turned on
- An input coupling capacitor is not required ( $A_2$ )

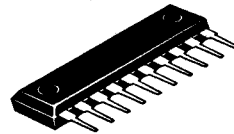
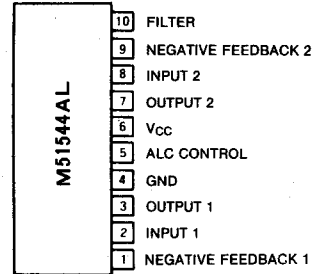
**APPLICATION**

Stereo cassette recorders

**RECOMMENDED OPERATING CONDITIONS**

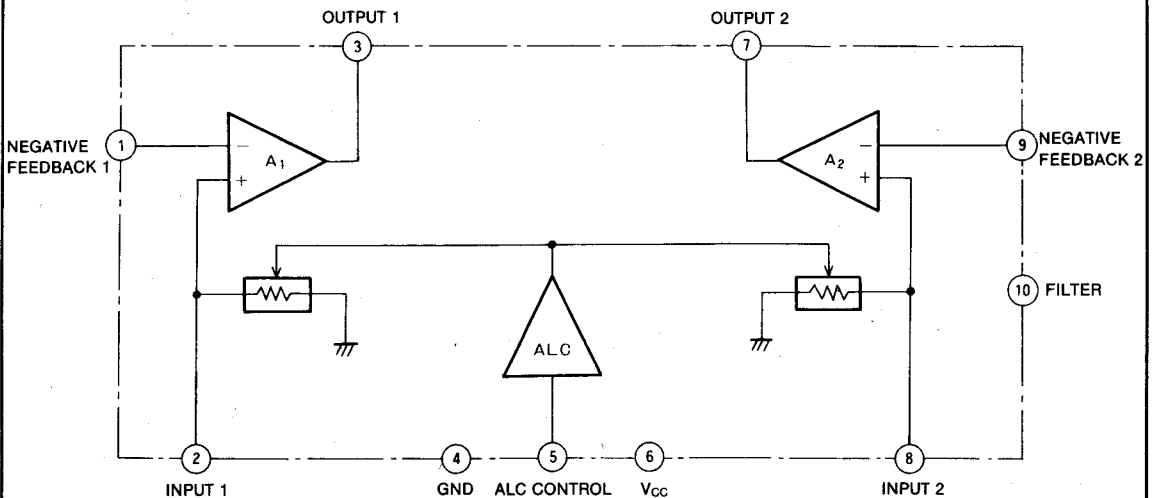
Supply voltage range .....  $5 \sim 15\text{V}$   
 Rated supply voltage .....  $9, 12\text{V}$

**PIN CONFIGURATION (TOP VIEW)**



10-pin molded plastic SIL

**BLOCK DIAGRAM**



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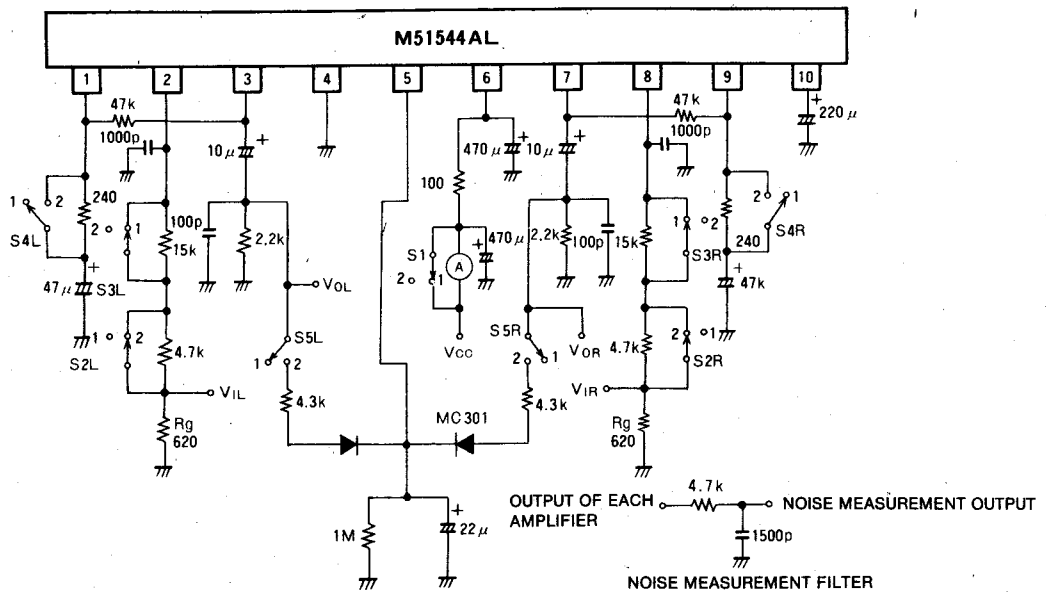
**ABSOLUTE MAXIMUM RATINGS** ( $T_a = 25^\circ\text{C}$ , unless otherwise noted)

Symbol	Parameter	Conditions	Limits	Unit
$V_{CC}$	Supply voltage		16	V
$I_{CC}$	Circuit current		27	mA
$P_d$	Power dissipation		650	mW
$K_\theta$	Thermal derating	$T_a \geq 25^\circ\text{C}$	6.5	mW/ $^\circ\text{C}$
$T_{opr}$	Operating temperature		-20 ~ +75	$^\circ\text{C}$
$T_{stg}$	Storage temperature		-40 ~ +125	$^\circ\text{C}$

**ELECTRICAL CHARACTERISTICS** ( $T_a = 25^\circ\text{C}$ ,  $f = 1\text{kHz}$ ,  $R_g = 620\Omega$ )

Symbol	Parameter	Test conditions		Limits			Unit
		$V_{CC}$		Min	Typ	Max	
$I_{CC0}$	Circuit current	9V	Quiescent		6	10	mA
$G_{VO}$	Open loop voltage gain	5V	$V_O = 0.3V_{rms}$	64	77		dB
		9V		67	80		
		12V		67	81		
THD	Total harmonic distortion	9V	$V_O = 0.3V_{rms}$		0.1	0.5	%
$G_{VC}$	Closed loop voltage gain	9V	$V_O = 0.3V_{rms}$	44	46	48	dB
$R_i$	Input resistance	9V	$V_O = 0.3V_{rms}$	17	27	38	k $\Omega$
$V_{OM}$	Maximum output voltage	9V	THD = 3%	1.3	2.0		$V_{rms}$
$N_O$	Output noise voltage	9V	$B_w = 20\text{Hz} \sim 20\text{kHz}$		210	650	$\mu V_{rms}$
$THD_{ALC}$	ALC distortion	9V	$V_i = -40\text{dBv}$		0.2	1.2	%
$\Delta V_{ALC}$	ALC balance	9V	$V_i = -40\text{dBv}, -10\text{dBv}$		0	2.5	dB
ALC	ALC range	9V	THD = 10%	40	55		dB

**TEST CIRCUIT**



Units Resistance:  $\Omega$   
 Capacitance: F

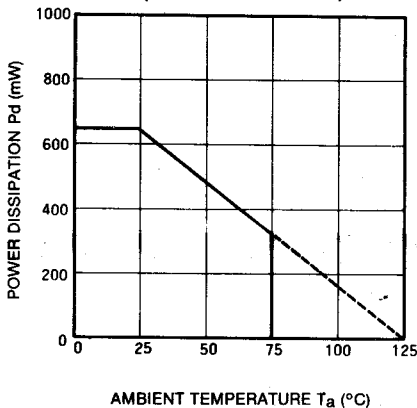
**DUAL PREAMPLIFIER WITH ALC**

**TEST METHOD**

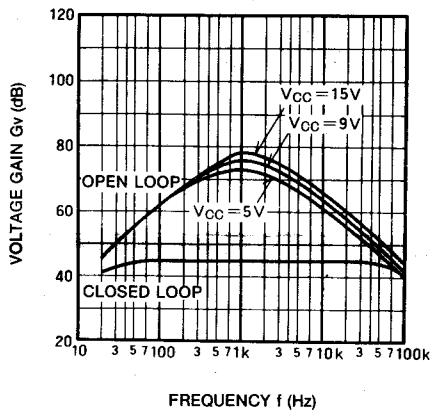
Parameter	State of switch					Test method
	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>	
I <sub>CCO</sub>	2	2	1	1	1	Measure circuit current in quiescent state
G <sub>VO</sub>	1	2	1	2	1	$G_{VOL} = 20 \log (V_{OL}/V_{IL})$ , $G_{VOR} = 20 \log (V_{OR}/V_{IR})$
THD	1	2	1	1	1	Measure the output distortion at pins ③ and ⑦
G <sub>VC</sub>	1	2	1	1	1	$G_{VCL} = 20 \log (V_{OL}/V_{IL})$ , $G_{VCR} = 20 \log (V_{OR}/V_{IR})$
R <sub>i</sub>	1	2	1, 2	1	1	If V <sub>1</sub> is the output with S <sub>3</sub> at 1, and V <sub>2</sub> is the output with S <sub>3</sub> at 2, $R_i = 15V_2/(V_1 - V_2)$ kΩ
V <sub>OM</sub>	1	2	1	1	1	Measure the output voltage with THD = 3 %
N <sub>o</sub>	1	2	1	1	1	Bw = 20Hz ~ 20kHz
THD <sub>ALC</sub>	1	1	1	1	2	Measure the output distortion at pins ③ and ⑦ with simultaneous inputs of V <sub>IL</sub> and V <sub>IR</sub>
ΔV <sub>OALC</sub>	1	1	1	1	2	Measure the difference in output voltages between pins ③ and ⑦ with simultaneous inputs of V <sub>IL</sub> and V <sub>IR</sub>
ALC	1	1	1	1	2	With pin ② and pin ⑧ voltage when ALC begins to operate as V <sub>I1</sub> and the input voltage of V <sub>I2</sub> as that voltage which causes a distortion of 10% at pins ③ and ⑦, $ALC = 20 \log (V_{I2}/V_{I1})$

**TYPICAL CHARACTERISTICS**

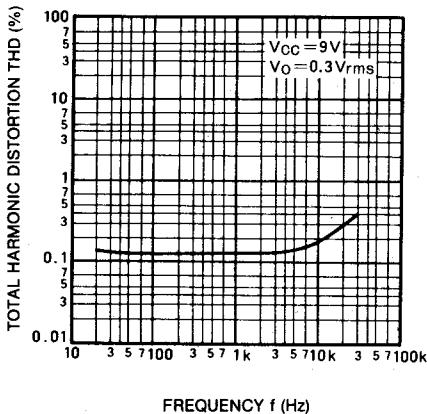
**THERMAL DERATING  
(MAXIMUM RATING)**



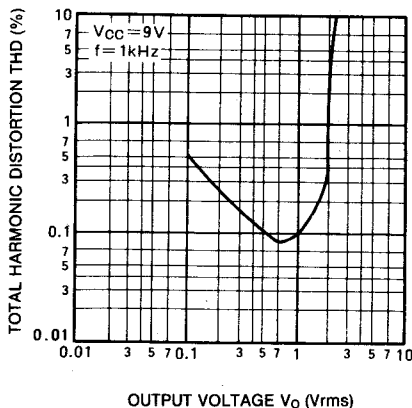
**VOLTAGE GAIN VS FREQUENCY**



**TOTAL HARMONIC DISTORTION  
VS FREQUENCY**

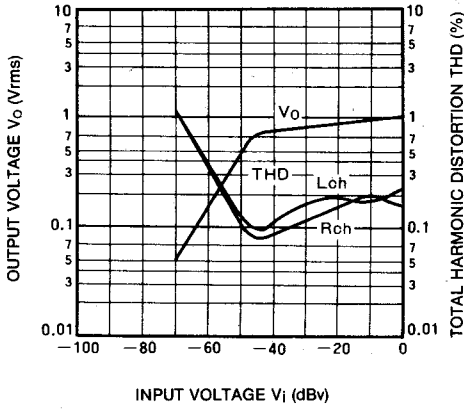


**TOTAL HARMONIC DISTORTION  
VS OUTPUT VOLTAGE**

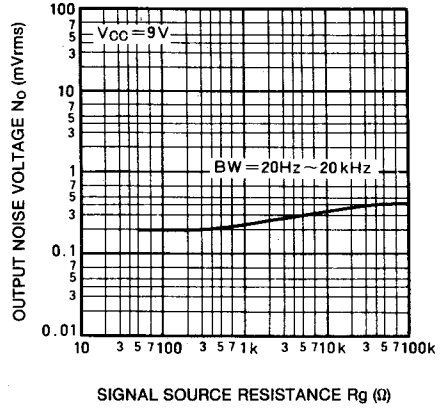


**DUAL PREAMPLIFIER WITH ALC**

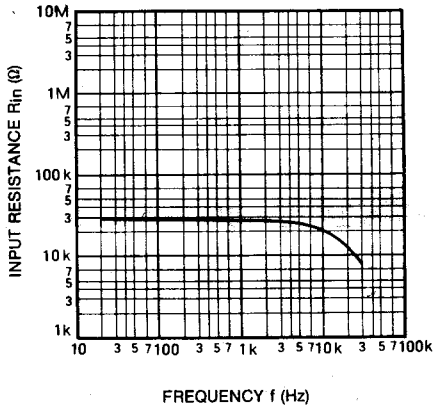
**ALC CHARACTERISTICS**



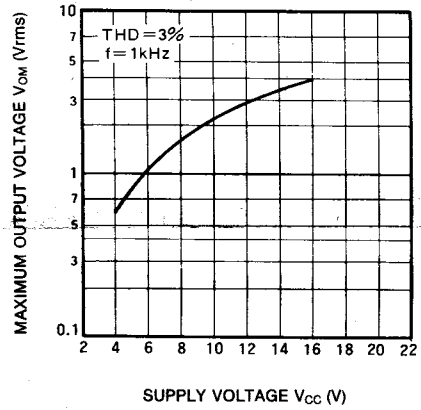
**OUTPUT NOISE VOLTAGE VS SIGNAL SOURCE RESISTANCE**



**INPUT RESISTANCE VS FREQUENCY**

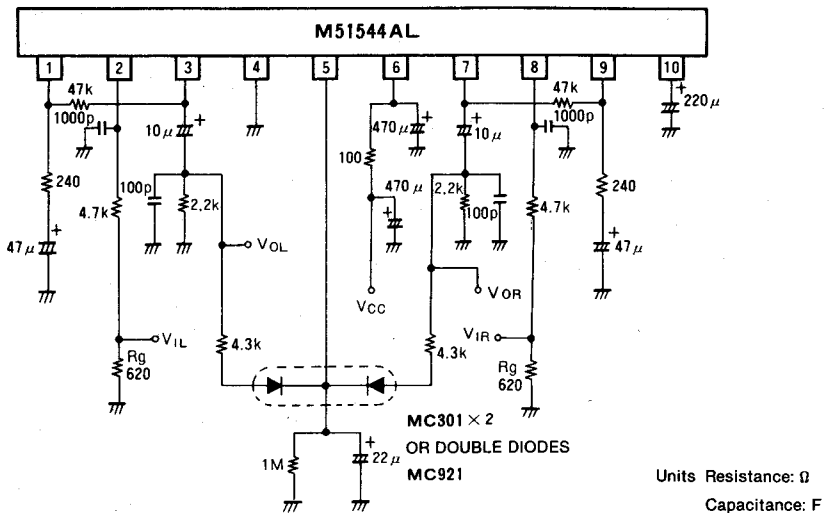


**OUTPUT VOLTAGE VS SUPPLY VOLTAGE**



**DUAL PREAMPLIFIER WITH ALC**

**APPLICATION EXAMPLE**



**TEST CIRCUIT PRINTED CIRCUIT BOARD LAYOUT**

