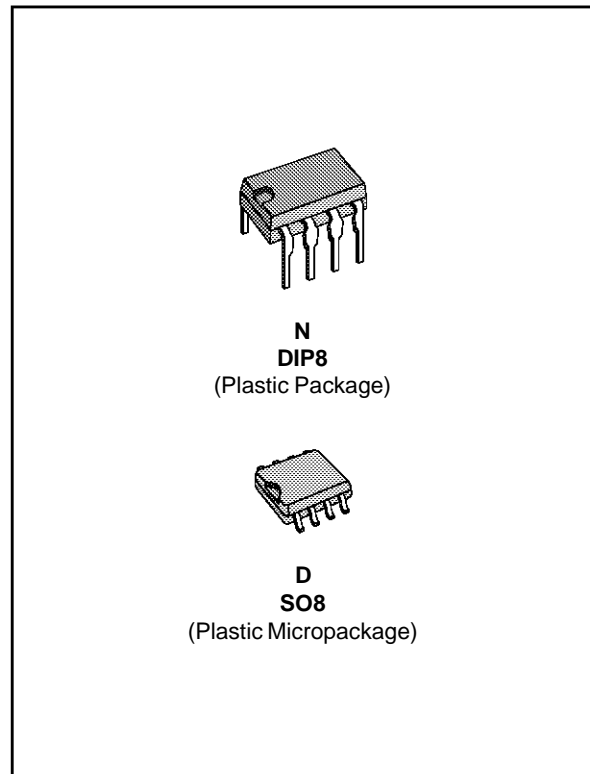


**LOW NOISE DUAL OPERATIONAL AMPLIFIERS**

- LOW VOLTAGE NOISE :  $4.5\text{nV}/\sqrt{\text{Hz}}$
- HIGH GAIN BANDWIDTH PRODUCT : 15MHz
- HIGH SLEW RATE :  $7\text{V}/\mu\text{s}$
- LOW DISTORTION : 0.002%
- LARGE OUTPUT VOLTAGE SWING :  
+14.3V/-14.6V
- LOW INPUT OFFSET VOLTAGE
- EXCELLENT FREQUENCY STABILITY
- ESD PROTECTION 2kV



**DESCRIPTION**

The MC33078 is a monolithic dual operational amplifier dedicated to audio applications. The MC33078 offers low voltage noise ( $4.5\text{nV}/\sqrt{\text{Hz}}$ ) and high frequency performances (15MHz gain bandwidth product,  $7\text{V}/\mu\text{s}$  slew rate).

In addition the MC33078 has a very low distortion (0.002%) and excellent phase/gain margins.

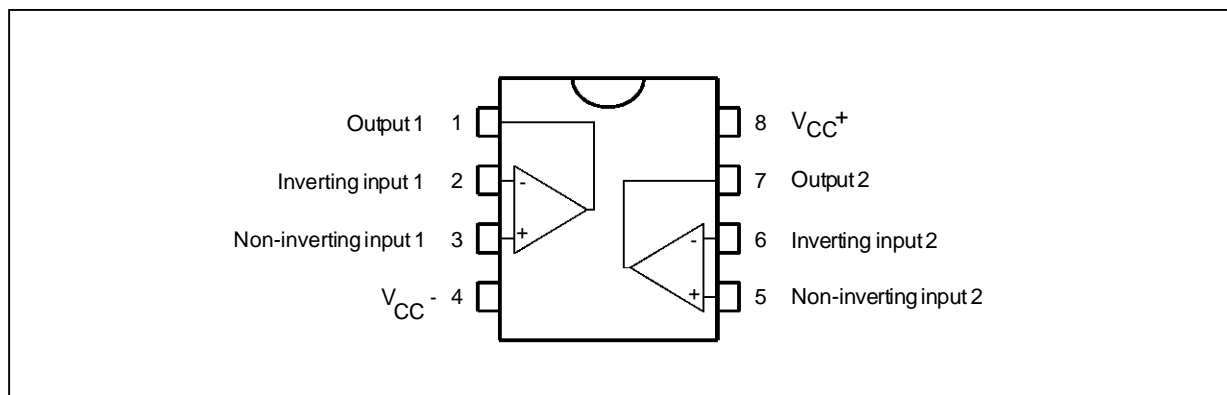
The output stage allows a large output voltage swing and symmetrical source and sink currents.

**ORDER CODES**

Part Number	Temperature Range	Package	
		N	D
MC33078	-40, +105°C	•	•

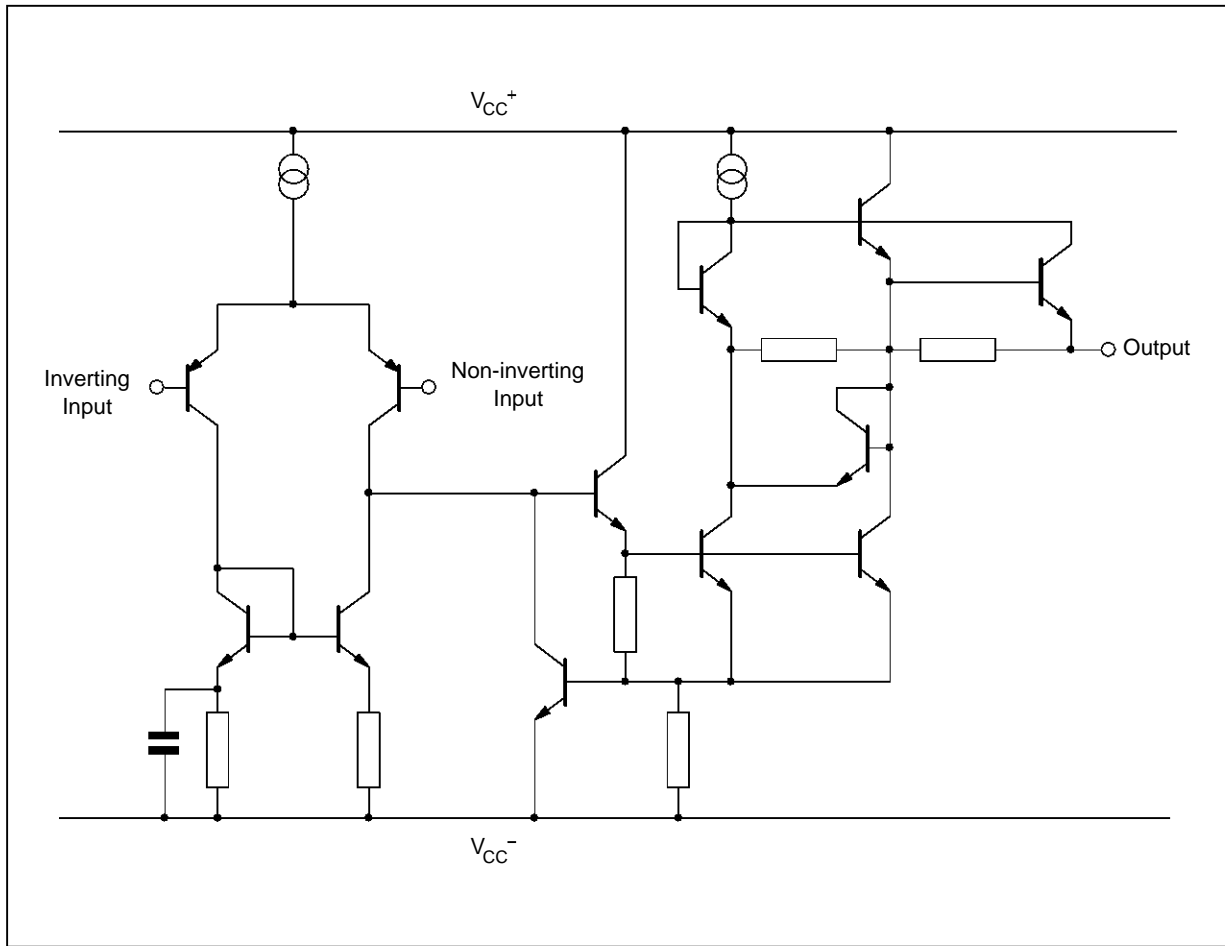
33078-01.TEL

**PIN CONNECTIONS (top view)**



33078-01.EPS

**SCHEMATIC DIAGRAM (1/2 MC33078)**



33078-02.EPS

**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	$\pm 18$ or $+36$	V
$V_{id}$	Differential Input Voltage - (note 1)	$\pm 30$	V
$V_i$	Input Voltage - (note 1)	$\pm 15$	V
	Output Short-Circuit Duration - (note 2)	Infinite	
$T_{oper}$	Operating Free-air Temperature Range	$-40$ to $+105$	$^{\circ}C$
$T_j$	Maximum Junction Temperature	$+150$	$^{\circ}C$
$T_{stg}$	Storage Temperature	$-65$ to $+150$	$^{\circ}C$
$P_{tot}$	Maximum Power Dissipation - (note 2)	500	mW

33078-02.TBL

- Notes :**
1. Either or both input voltages must not exceed the magnitude of  $V_{CC+}$  or  $V_{CC-}$ .
  2. Power dissipation must be considered to ensure maximum junction temperature ( $T_j$ ) is not exceeded

**OPERATING CONDITIONS**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	$\pm 2.5$ to $\pm 15$	V

33078-03.TBL

**ELECTRICAL CHARACTERISTICS**
 $V_{CC}^+ = +15V$ ,  $V_{CC}^- = -15V$ ,  $T_{amb} = 25^\circ C$  (unless otherwise specified)

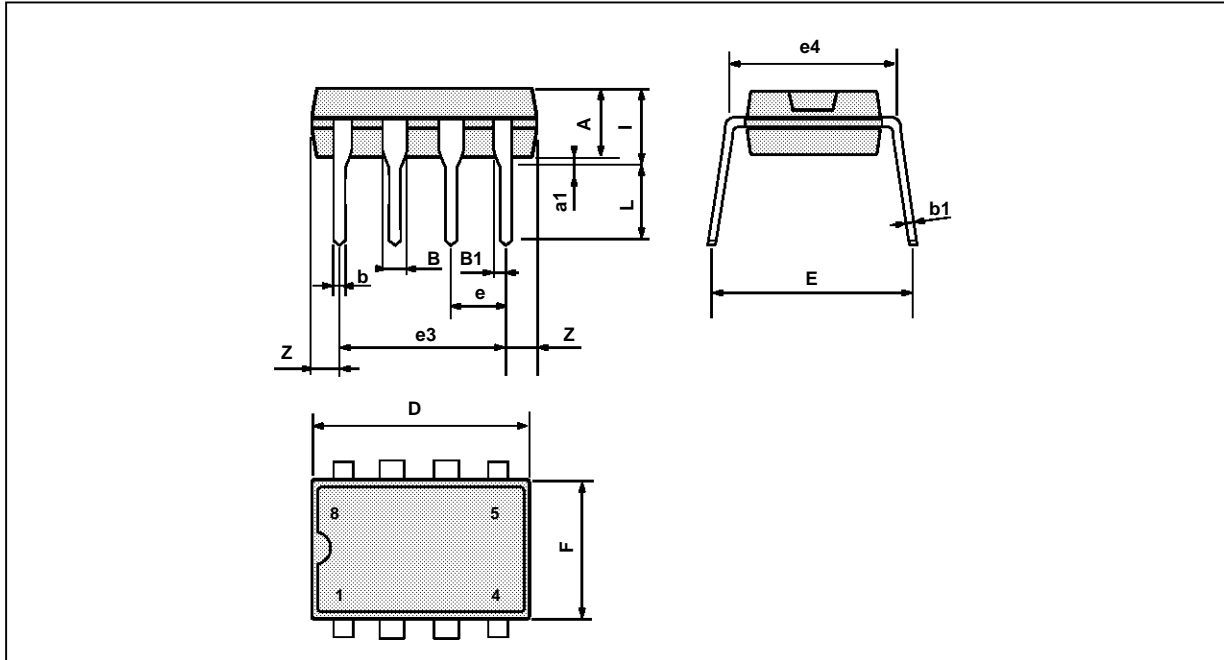
Symbol	Parameter	Min.	Typ.	Max.	Unit
$V_{io}$	Input Offset Voltage ( $V_o = 0V$ , $V_{ic} = 0V$ ) $T_{amb} = +25^\circ C$ $T_{min.} \leq T_{amb} \leq T_{max.}$		0.15	2 3	mV
$DV_{io}$	Input Offset Voltage Drift $V_{ic} = 0V$ , $V_o = 0V$ , $T_{min.} \leq T_{amb} \leq T_{max.}$		2		$\mu V/^\circ C$
$I_{io}$	Input Offset Current ( $V_{ic} = 0V$ , $V_o = 0V$ ) $T_{amb} = +25^\circ C$ $T_{min.} \leq T_{amb} \leq T_{max.}$		10	150 175	nA
$I_{ib}$	Input Bias Current ( $V_{ic} = 0V$ , $V_o = 0V$ ) $T_{amb} = +25^\circ C$ $T_{min.} \leq T_{amb} \leq T_{max.}$		250	750 800	nA
$V_{icm}$	Common Mode Input Voltage Range ( $\Delta V_{IO} = 5mV$ , $V_o = 0V$ )	$\pm 13$	$\pm 14$		V
$A_{vd}$	Large Signal Voltage Gain ( $R_L = 2k\Omega$ , $V_o = \pm 10V$ ) $T_{amb} = +25^\circ C$ $T_{min.} \leq T_{amb} \leq T_{max.}$	90 85	100		dB
$\pm V_{opp}$	Output Voltage Swing ( $V_{id} = \pm 1V$ )  $R_L = 600\Omega$ $R_L = 600\Omega$  $R_L = 2.0k\Omega$ $R_L = 2.0k\Omega$  $R_L = 10k\Omega$ $R_L = 10k\Omega$		12.2 -12.7  14 -14.2  14.3 -14.6		V
CMR	Common Mode Rejection Ratio ( $V_{ic} = \pm 13V$ )	80	100		dB
SVR	Supply Voltage Rejection Ratio $V_{CC}^+ / V_{CC}^- = +15V / -15V$ to $+5V / -5V$	80	105		dB
$I_o$	Output Short Circuit Current ( $V_{id} = \pm 1V$ , Output to Ground) Source Sink	15 20	29 37		mA
$I_{CC}$	Supply current ( $V_o = 0V$ , All Amplifiers) $T_{amb} = +25^\circ C$ $T_{min.} \leq T_{amb} \leq T_{max.}$		4	5 5.5	mA
SR	Slew Rate $V_i = -10V$ to $+10V$ , $R_L = 2k\Omega$ , $C_L = 100pF$ , $A_v = +1$	5	7		V/ $\mu s$
GBP	Gain Bandwidth Product ( $f = 100kHz$ , $R_L = 2k\Omega$ , $C_L = 100pF$ )	10	15		MHz
B	Unity Gain Bandwidth (Open loop)		9		MHz
$A_m$	Gain Margin ( $R_L = 2k\Omega$ ) $C_L = 0pF$ $C_L = 100pF$		-11 -6		dB
$\phi_m$	Phase Margin ( $R_L = 2k\Omega$ ) $C_L = 0pF$ $C_L = 100pF$		55 30		Degrees
$e_n$	Equivalent Input Noise Voltage ( $R_s = 100\Omega$ , $f = 1kHz$ )		4.5		$\frac{nV}{\sqrt{Hz}}$
$i_n$	Equivalent Input Noise current ( $f = 1kHz$ )		0.5		$\frac{pA}{\sqrt{Hz}}$
THD	Total Harmonic Distortion $R_L = 2k\Omega$ , $f = 20Hz$ to $20kHz$ , $V_o = 3V_{rms}$ , $A_v = +1$		0.002		%
$V_{O1}/V_{O2}$	Channel Separation ( $f = 20Hz$ to $20kHz$ )		120		dB
FPB	Full Power Bandwidth ( $V_o = 27V_{pp}$ , $R_L = 2k\Omega$ , $THD \leq 1\%$ )		120		kHz
$Z_o$	Output Impedance ( $V_o = 0V$ , $f = 9MHz$ )		37		$\Omega$
$R_i$	Input Resistance ( $V_{ic} = 0V$ )		175		$k\Omega$
$C_i$	Input Capacitance ( $V_{ic} = 0V$ )		12		pF

33078-04.TBL

# MC33078

## PACKAGE MECHANICAL DATA

8 PINS - PLASTIC DIP

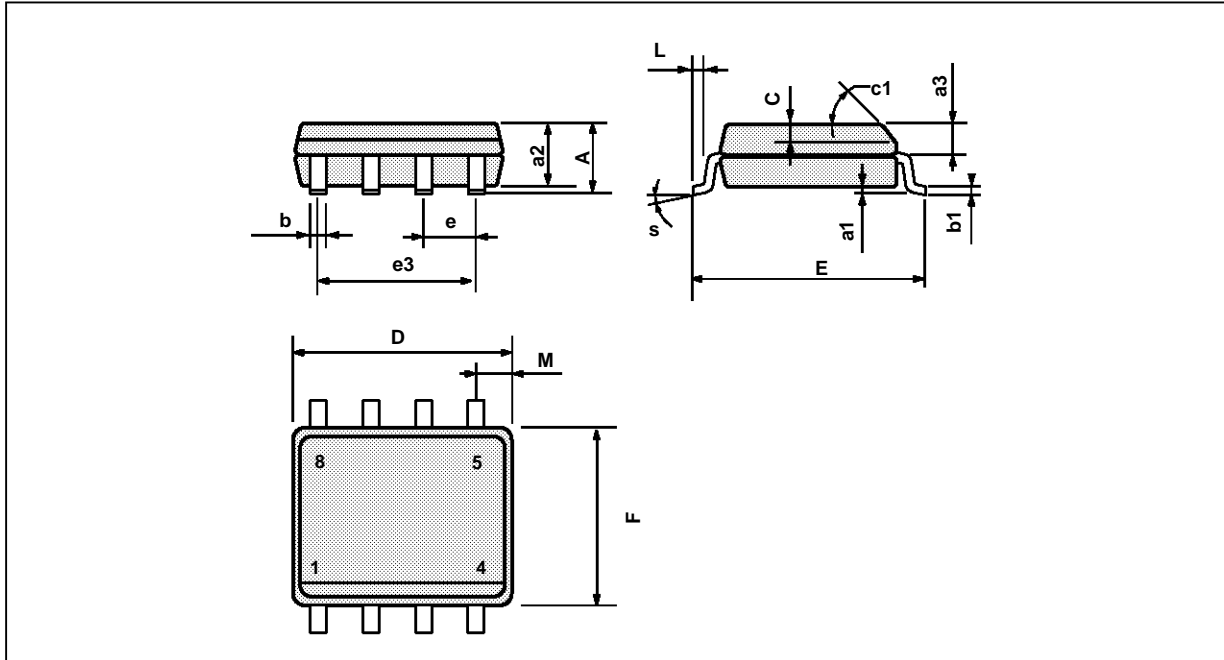


PM-DIP8.EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		3.32			0.131	
a1	0.51			0.020		
B	1.15		1.65	0.045		0.065
b	0.356		0.55	0.014		0.022
b1	0.204		0.304	0.008		0.012
D			10.92			0.430
E	7.95		9.75	0.313		0.384
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			6.6			0.260
i			5.08			0.200
L	3.18		3.81	0.125		0.150
Z			1.52			0.060

DIP8.TBL

**PACKAGE MECHANICAL DATA**  
8 PINS - PLASTIC MICROPACKAGE (SO)



PW-S08&EPS

Dimensions	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45° (typ.)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.150		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8° (max.)					

S08.TBL

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