VP-1608F
Digital Voice Processor

FEATURES

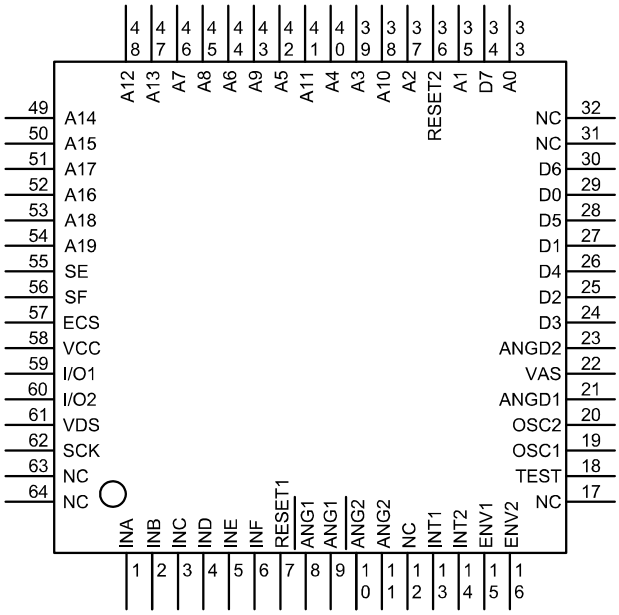
- Plays messages stored in external EPROM chips
- CVSD technique with adjustable sampling rate from 16K to 128K bps for different voice quality
- Dual-channel audio output
- Up to 64 segments per channel
- Built-in RC oscillator or use external clock
- Direct EPROM addressing up to 8M bits
- Low power, single voltage operation
- Microprocessor interface
- Low-cost VP-880 system available for quick and easy voice development

GENERAL DESCRIPTIONS

The VP-1608F is a CMOS voice processor chip based on the CVSD (Continuously Variable Slope Delta) modulation technique. The VP-1608F is exactly the same as the (now obsolete) VP-1608 except that it is packaged in 64-pin QFP instead of 68-pin PLCC.

Note that although the dual channel output provided by the VP-1608F can be used as a stereo output, it will be hard to do so since the VP-880 Voice Development System does not allow voice digitization in stereo mode.

VP-1608F (QFP44) Pin Assignment



Therefore the dual channel output is usually used in applications where sound synchronization is not critical. For example, in a game equipment, channel A can be playing a continuous background sound while channel B plays short sound effects based on the player's action.

The dual channel output is available on two separate output pins. They can be used independently, or mixed together externally. Each channel may control up to 64 sound segments stored in 4 different EPROM banks, with up to 16 segments in each bank.

Each segment stored in the EPROM is represented by a unique binary code: 2 bits for the bank code and 4 bits for the segment code. A valid code plus a strobe signal are all it takes to activate a certain segment.

The VP-1608F can operate in a wide range of sampling rates (from 16 to 128 Kbps). A higher sampling rate usually produces better sound quality at the expense of higher memory cost. As a rule of thumb, start with 32 Kbps. A 1M EPROM can store 32 seconds of sound at this rate.

Thanks to the chip's high internal integration, very little external components are required to build a VP-1608F based design. The VP-880 Voice Development System is available for quick and easy in-house voice development.

APPLICATIONS

- Dual channel, multiple message playback
- Sound effects generator
- Digital announcer for consumer, industrial, security and telecommunication products

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ABSOLUTE MAXIMUM RATINGS*

Supply Voltage, V_{CC} - V_{DS} ..... 0 to 5.5V
Input Volotage, V_{IN} ..... V_{DS} to V_{CC}
Operating Temperature, T_{OP} ..... -10°C to 60°C
Storage Temperature, T_{ST} ..... -20°C to 80°C

* Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

ELECTRICAL CHARACTERISTICS

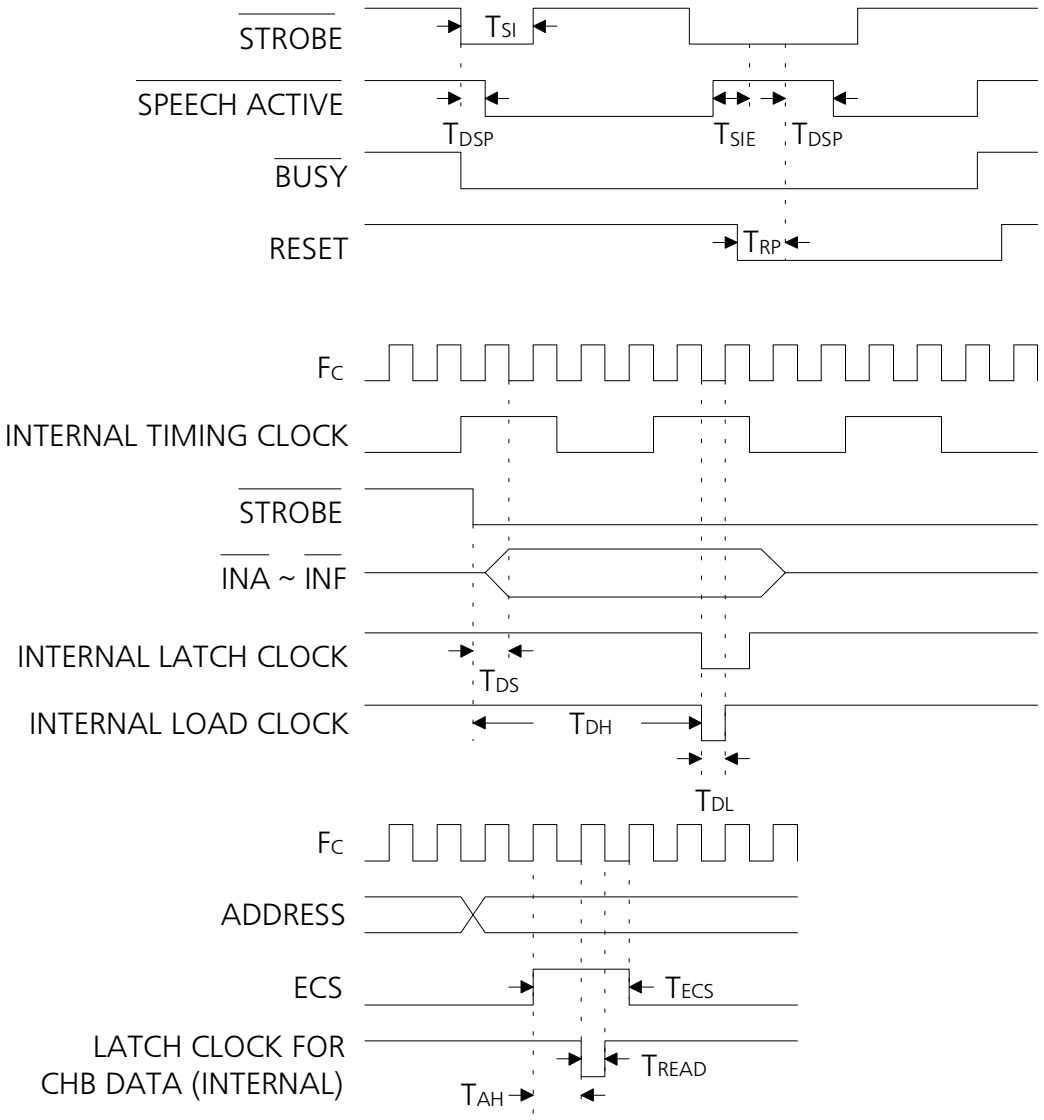
Symbol	Parameter	Min.	Typ.	Max.	Units
V_{CC}	Supply Voltage	4.5	5	5.5	V
I_{DD}	Standby Current		50		uA
I_{DRIVE}	Output Current V_{OH}=2.4V		4		mA
I_{SINK}	Output Current V_{OL}=0.4V		4		mA
V_{IH}	Input Voltage (High)		3.5		V
V_{IL}	Input Voltage (Low)		1.5		V
F_C	Internal Scan Clock		8		MHz
F_S	Sampling Clock	20	32	128	KHz
T_{RESET}	Reset Pulse Width		1		us
T_{SI}	Strobe Input Pulse Width		1		us
T_{SIE}	Strobe Inhibit Time After EOS (1)		1.5		ms
T_{DSP}	Delay Time From Strobe To Play (2)			150	ms
T_{RP}	Edge-Triggered Reset Interval		1		us
T_{DS}	Data Setup Time For INA ~ INF			350	ns
T_{DH}	Data Hold Time For INA ~ INF		1		us
T_{DL}	Internal Load Pulse For INA ~ INF		65		ns
T_{ECS}	Address Valid Time For Ch. B EPROM		250		ns
T_{READ}	Internal Latch Pulse For Ch. B EPROM Data		65		ns
T_{AH}	Address Stable Time For Ch. B			125	ns

Note:

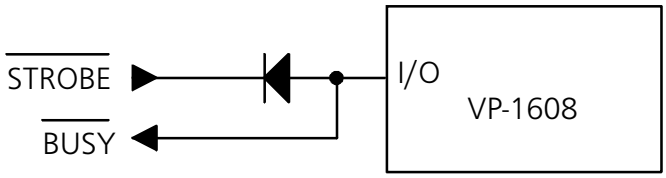
(1) EOS = End-Of-Speech

(2) Based on 1M EPROM scanning.

TIMING DIAGRAM



TEST CIRCUIT FOR I/O PIN



PIN DESCRIPTIONS

A0 ~ A19:
Address output to EPROM. Both channels share the same address lines in a 50-50 time sharing fashion. Pin ECS (described below) must be examined to tell who's address is valid at any particular moment.

ANG1 & ANG1\:
Differential audio output for channel A, connect to LM324 or LM358.

ANG2 & ANG2\:
Differential audio output for channel B, connect to LM324 or LM358.

ANGD1:
Audio feedback input for channel A.

ANGD2:
Audio feedback input for channel B.

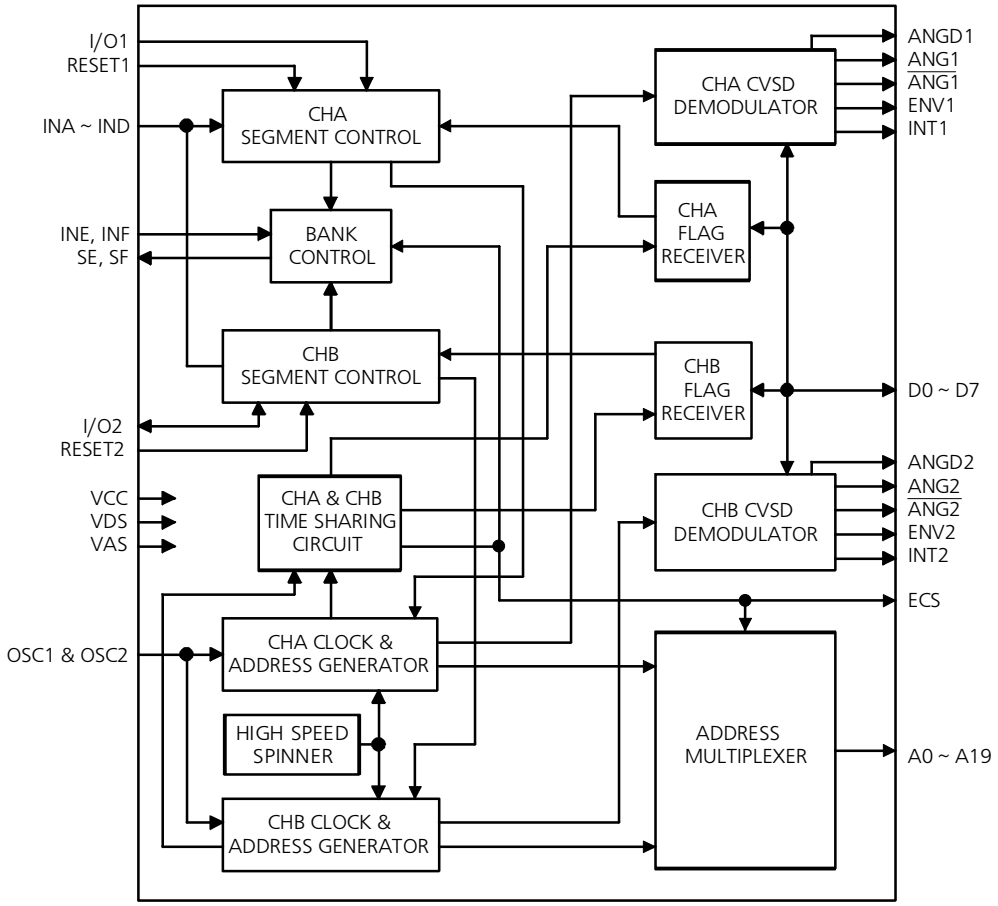
D0 ~ D7:
Data input from EPROM.

ECS:
EPROM Channel Select output. This signal is used to indicate who's address is on the address lines. When the ECS is low, the address is for channel A. When the ECS is high, the address is for channel B.

If both channels share one EPROM, this signal is usually connected to the highest address line so that each channel uses exactly half the EPROM space. If more than one EPROM are used, this signal is usually used by the address decoder to select the proper EPROM.

ENV1:
Envelop input for channel A, to be connected to INT1 with a feedback resistor.

Block Diagram



ENV2:
Envelop input for channel B, to be connected to INT2 with a feedback resistor.

INT1:
Integrator output for channel A, to be connected to an external RC integration circuitry.

INT2:
Integrator output for channel B, to be connected to an external RC integration circuitry.

I/O1:
Strobe input/Busy output for channel A, active low. To play a message on channel A, place the segment/bank code on INA to INE and strobe this pin with a low pulse. During the playback this pin becomes an active-low "busy" output. If this pin is held low at the end of playback, the message will be re-triggered.

I/O2:
Same as I/O1 except that this pin is for channel B.

INA ~ IND:
Input for segment code in binary format. INA is the LSB and IND is the MSB.

INE, INF:
Input for bank code in binary format, max. 4 banks. INE is the LSB and INF is the MSB.

OSC1, OSC2:
Internal oscillator pins for external RC components. It external clock source is to be used, feed it through the OSC2 pin. Note that both channels share the same clock, so their sampling rate must be the same.

RESET1:
Reset input for channel A, active low. On the falling edge of this reset signal, channel A playback is stopped and all internal counters for channel A are cleared.

RESET2:
Reset input for channel B, active low. On the falling edge of this reset signal, channel B playback is stopped and all internal counters for channel B are cleared.

SCK, TEST:
For factory use only, do not make any connection.

SE, SF:
Output for EPROM bank select. These two pins are actually latched outputs for INE and INF.

VDD:
Input, supply voltage.

VDS & VAS:
VDS is digital ground and VAS is analog ground. Connect the two grounds together close to the power source to minimize noise.

APPLICATION NOTES

1. EOM (End Of Message) Flag
The EOM flag consists of six consecutive bytes of "AA", or "10101010" in binary format. After a trigger signal is received, the VP-1608 uses the internal 8MHz system clock to scan through memory space and finds the correct message by counting the number of EOM flags. For example, to find the 5th message, it must scan through each and every memory location until it finds 4 EOM flags. The first byte following the 4th EOM flag is the first byte of the 5th message.

2. Creating Master EPROM File on the VP-880 System
Follow these steps to create the master EPROM file:

1. To maximize the EPROM usage, arrange your sound segments in banks of 16 or less, so that the total combined length for each bank is about the same. Do not mix channel A and channel B together.

2. Based on the total combined length of the largest bank, select a highest sampling rate that will fully utilize the EPROM. Use the following equation:

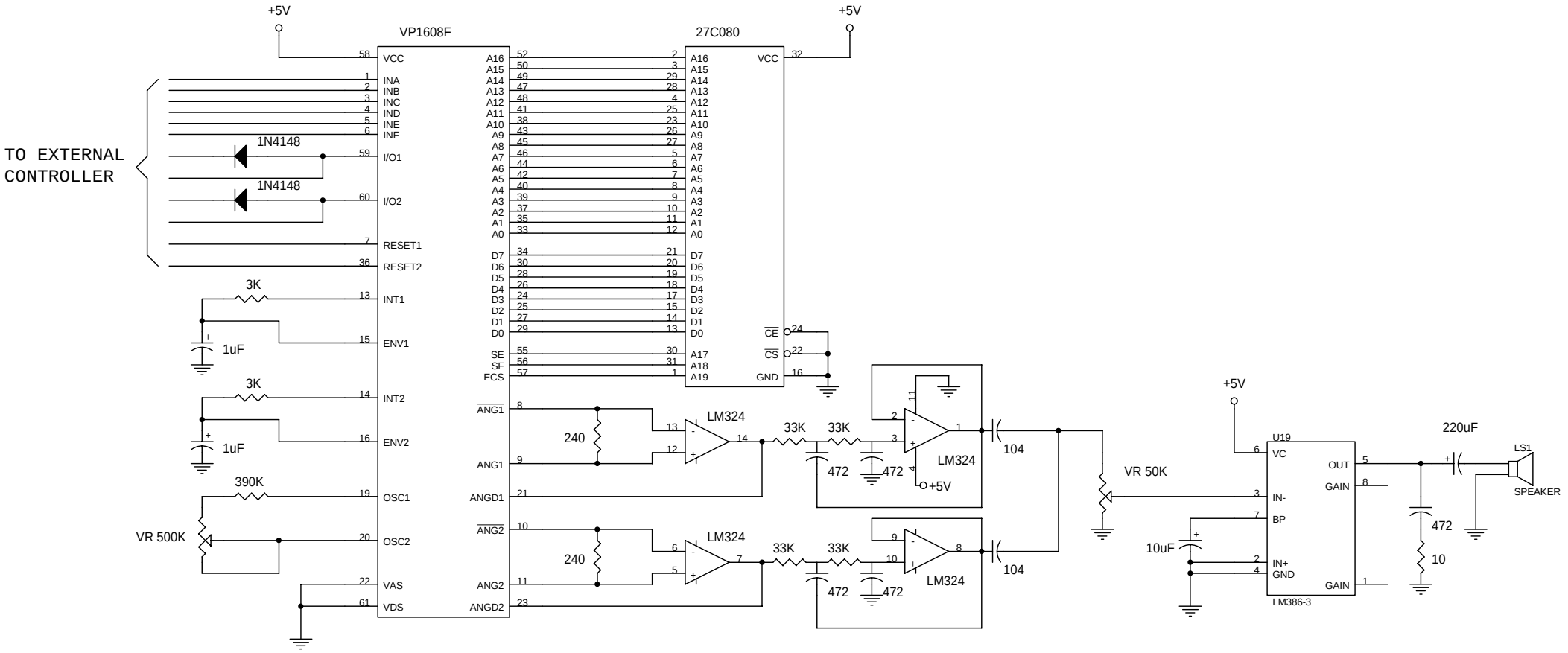
Sampling Rate (Kbps) =
EPROM Size (K-bits) / Total Length (Second)

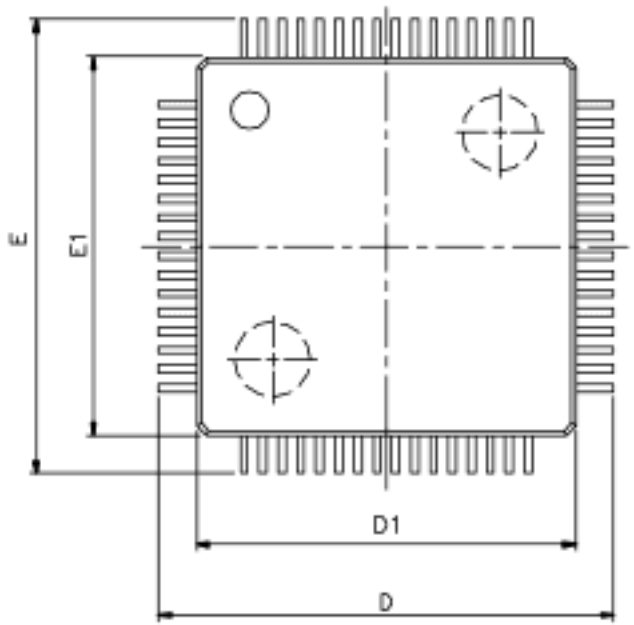
3. Digitize and edit each segment as a separate file. Use the "ROM Data Management" function to combine up to 16 messages into a "bank file". The first filename entered in the "ROM Data Management" is the first segment in that bank, and etc.

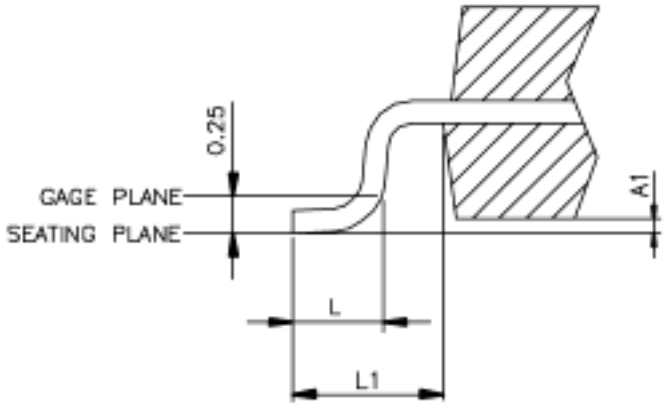
4. Depending on the hardware design, each EPROM chip may contain one or more sound banks. It is also possible to use just one EPROM to store all sound segments of both channel A and channel B. If you need to combine several bank files into one for programming into one EPROM chip, use the following DOS command:

COPY /b file_1+file_2+..+file_n destination_file

Do not use the "ROM Data Management" function to combine bank files, otherwise each bank file will be considered as a single message file.


TO EXTERNAL CONTROLLER
+5V
VP1608F
27C080
+5V
VCC
INA
INB
INC
IND
INE
INF
I/O1
I/O2
RESET1
RESET2
INT1
ENV1
INT2
ENV2
OSC1
OSC2
VAS
VDS
1N4148
1N4148
3K
1uF
3K
1uF
390K
VR 500K
A16
A15
A14
A13
A12
A11
A10
A9
A8
A7
A6
A5
A4
A3
A2
A1
A0
D7
D6
D5
D4
D3
D2
D1
D0
SE
SF
ECS
ANG1
ANGD1
ANG2
ANGD2
CE
CS
GND
A17
A18
A19
LM324
LM324
LM324
240
240
33K
33K
33K
33K
472
472
472
472
104
104
+5V
VR 50K
10uF
U19
VC
OUT
GAIN
IN-
BP
IN+
GND
GAIN
LM386-3
220uF
LS1
SPEAKER
472
10





VARIATIONS (ALL DIMENSIONS SHOWN IN MM)

SYMBOLS	MIN.	MAX.
A	--	1.60
A1	0.05	0.15
A2	1.35	1.45
b	0.17	0.27
c1	0.09	0.16
D	12.00 BSC	
D1	10.00 BSC	
E	12.00 BSC	
E1	10.00 BSC	
e	0.50 BSC	
L	0.45	0.75
L1	1.00 REF	

NOTES:

1.JEDEC OUTLINE:MS-026 BCD

2.DIMENSIONS D1 AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS 0.25mm PER SIDE. D1 AND E1 ARE MAXIMUM PLASTIC BODY SIZE DIMENSIONS INCLUDING MOLD MISMATCH.

3.DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION.ALLOWABLE DAMBAR PROTRUSION SHALL NOT CAUSE THE LEAD WIDTH TO EXCEED THE MAXIMUM b DIMENSION BY MORE THAN 0.08mm.