- Artigo bem completo sobre geração de tons com o integrado CMOS 4011
(ruim de imprimir o artigo, porque desposiciona)
https://www.eleccircuit.com/4011-tone-generator/

- Como os multivibradores astáveis usam a função das portas lógicas
- How Astable Multivibrator using Logic Gates work - Example Circuits
https://www.eleccircuit.com/oscillator-circuits

- Waybackmachine – The interesting world of Stepan Novotill – Ultrasonic Pest Repeller -
https://web.archive.org/web/20100605140919/http://members.shaw.ca/novotill/UltrasonicPestRepeller/index.htm

- Circuits Diagram - Circuito de Ludwig Libertin, publicado na Elektor -
http://circuitsdiagramlab.blogspot.com/2012/06/simple-us-style-siren-circuit.html

- Homemade Circuit Projects - 5 Simple Siren Circuits you can Build at Home -
https://www.homemade-circuits.com/car-siren-circuit/

- Discover Circuits – Sirens
http://www.discovercircuits.com/S/siren.htm

- Electroschematics – Electronic siren circuit with multitone
https://www.electroschematics.com/multitone-electronic-siren/

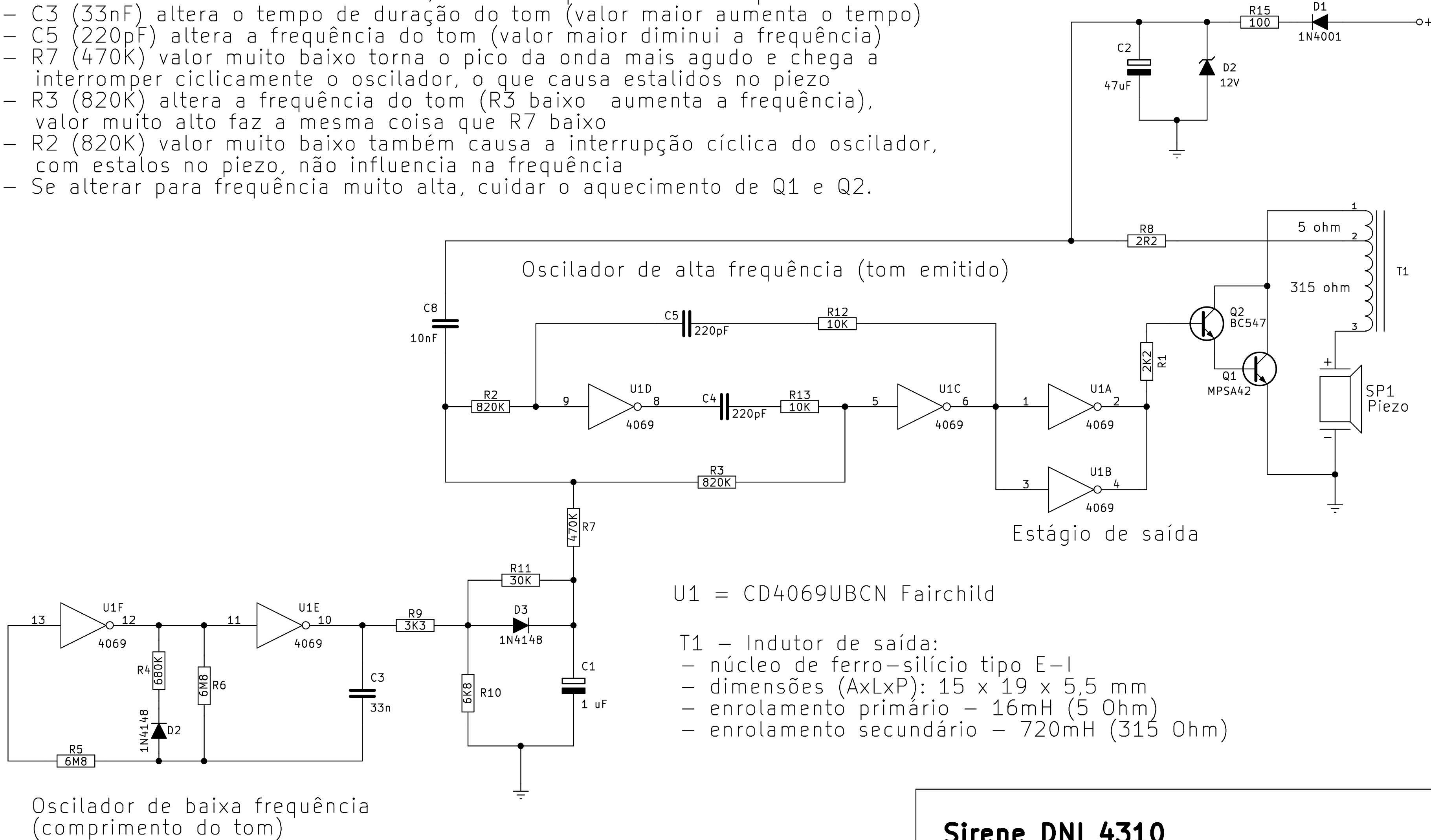
- Electronics for You – Página inicial - https://www.electronicsforu.com
  A mesma mostrada do Electroschematics, esta parece ser original
https://www.electronicsforu.com/electronics-projects/multitone-siren

- Sirene de chaves configuráveis - alarme
https://www.electronicsforu.com/electronics-projects/hardware-diy/multi-tone-configurable-alarm-2

- ElecCircuit - High power siren circuit using CD40106 and TIP31, small and easy
https://www.eleccircuit.com/high-power-siren-circuit-using-cd40106/

- Aurelienr – Página inicial - http://www.aurelienr.com/
- Sirene com layout da placa, disponível também códigos para cad eletrônico no arquivo zipado
- Sirene moyenne puissance (pour alarme)
http://www.aurelienr.com/electronique/archives/sirene.zip

- O som emitido é um tom cíclico, cuja frequência varia entre dois extremos; a forma de onda é dente de serra, modulada por outra de frequência bem menor
- C3 (33nF) altera o tempo de duração do tom (valor maior aumenta o tempo)
- C5 (220pF) altera a frequência do tom (valor maior diminui a frequência)
- R7 (470K) valor muito baixo torna o pico da onda mais agudo e chega a interromper ciclicamente o oscilador, o que causa estalidos no piezo
- R3 (820K) altera a frequência do tom (R3 baixo aumenta a frequência), valor muito alto faz a mesma coisa que R7 baixo
- R2 (820K) valor muito baixo também causa a interrupção cíclica do oscilador, com estalos no piezo, não influencia na frequência
- Se alterar para frequência muito alta, cuidar o aquecimento de Q1 e Q2.



U1 = CD4069UBCN Fairchild

T1 - Indutor de saída:
- núcleo de ferro-silício tipo E-I
- dimensões (AxLxP): 15 x 19 x 5,5 mm
- enrolamento primário - 16mH (5 Ohm)
- enrolamento secundário - 720mH (315 Ohm)

Sirene DNI 4310

Sheet: /
File: SireneDNI 4310.sch

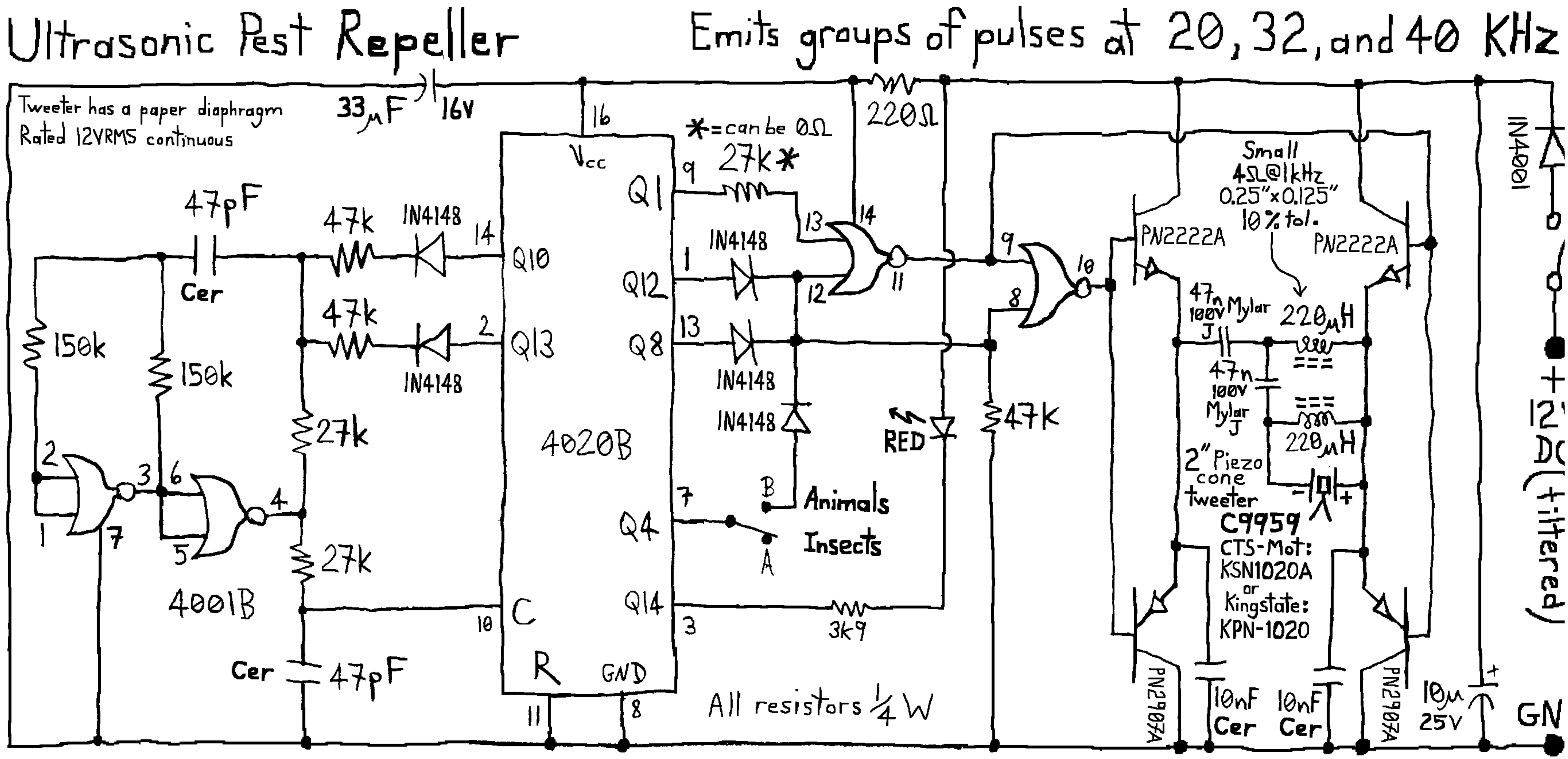
Title:

Size: A4 | Date: | **Rev:**

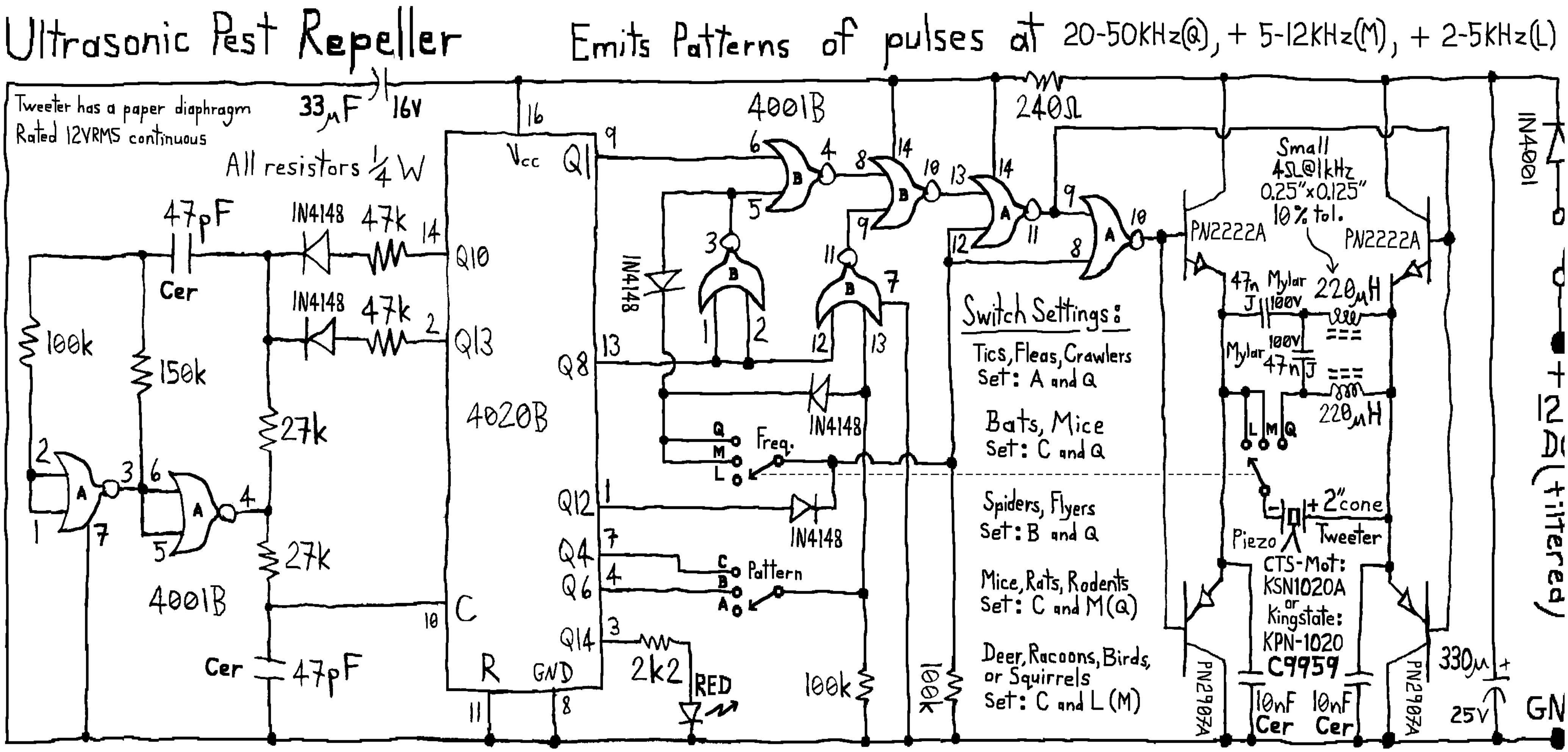
KiCad E.D.A. kicad 4.0.1-stable | Id: 1/1

Ultrasonic Pest Repeller - These emit noise to confuse or agitate insects or animals HOME

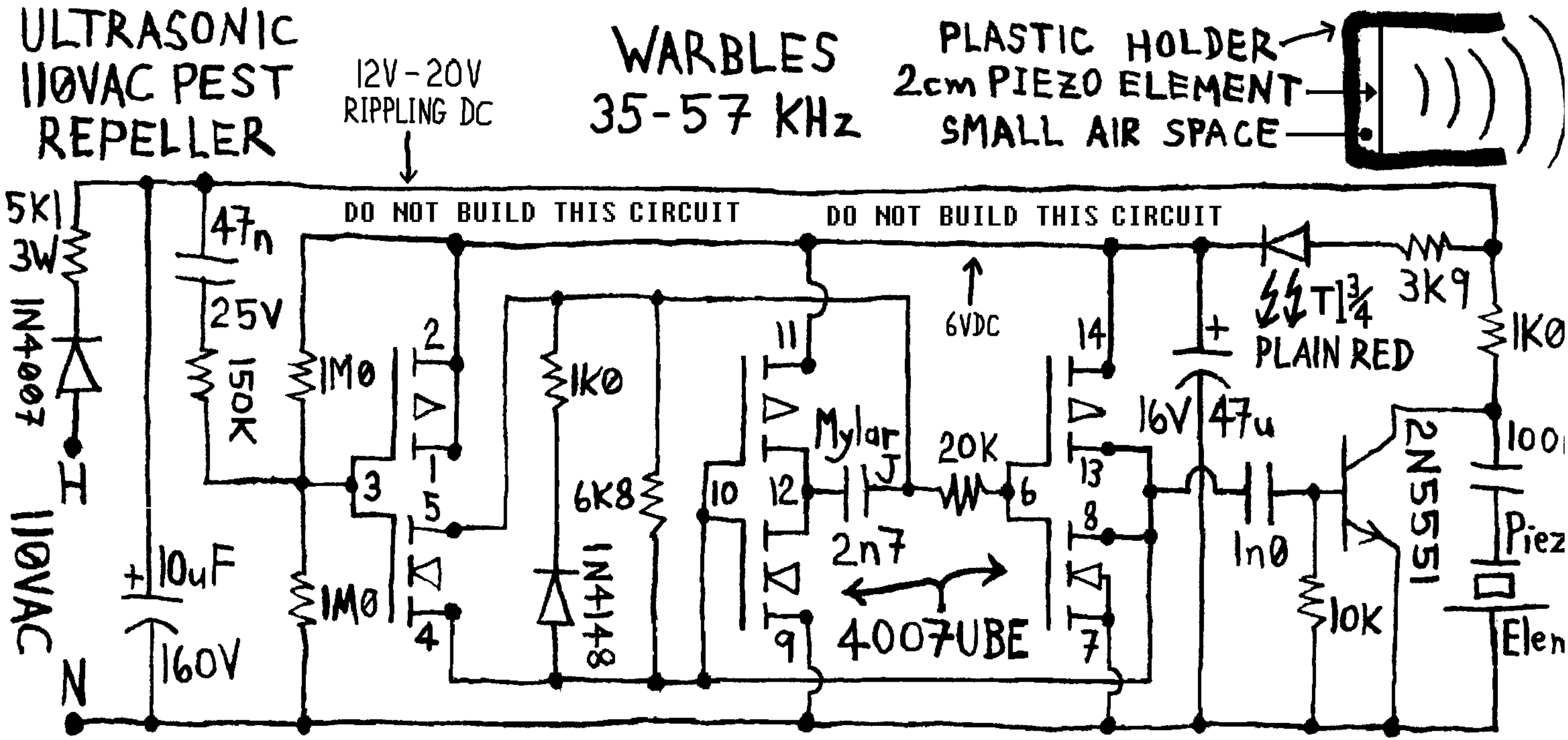
This is one of the better and more popular brands. It emits bursts of pulses at different frequencies. I did not find any spider webs inside this unit:



Here is a higher end version of the same thing, with a few extra user selectable settings to allow audible as well as ultrasonic output so it can be more effective against animals:



And a cheapo one that runs directly off the AC line:



I do not gaurantee the accuracy or safety of any information herein.

email me snovotill@hotmail.com HOME

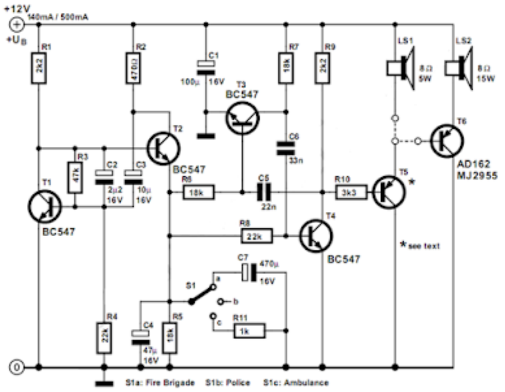
Do not experiment with or build any of the above circuits.

Simple US-Style Siren Circuit

IN AUDIO AND MUSIC - ON 8:49 PM - NO COMMENTS

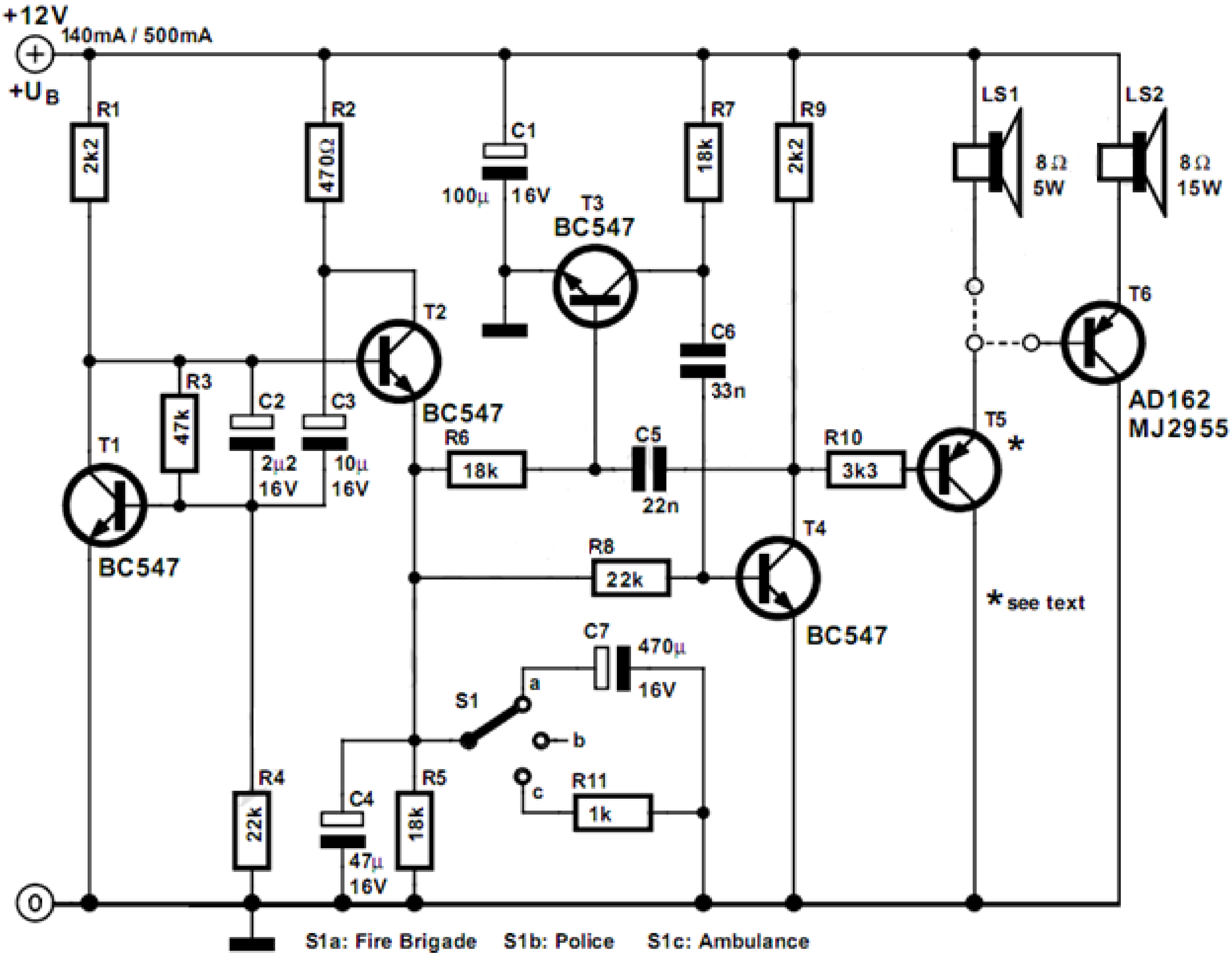
The circuit described here can create three different 'US-style' siren sounds: police, ambulance and fire engine. The desired sound can be selected using switch S1. The circuit can be used in toys (such as model vehicles), as part of an alarm system, and in many other applications. For use in a toy, a BC337 is an adequate device for driver T5, since it is capable of directly driving a 200mW (8Ω) loudspeaker.

Simple US-Style Siren Circuit Diagram:



In this case the current consumption from a 9 V power supply is around 140 mA. If a louder sound is required, a BD136 is recommended: this can drive a 5W (8Ω) loudspeaker. The current consumption from a 12 V supply will then be about 180mA. If still more volume is desired, then T5 (a BD136) can be used as a first driver stage, and a 15W (8Ω) loudspeaker can be connected via output transistor T6.
Here an AD162 or an MJ2955 can be used, which, for continuous operation, must be provided with cooling. The peak current consumption of the circuit will now be about 500mA with a 12V power supply. Capacitor C1 is not required for battery operation.

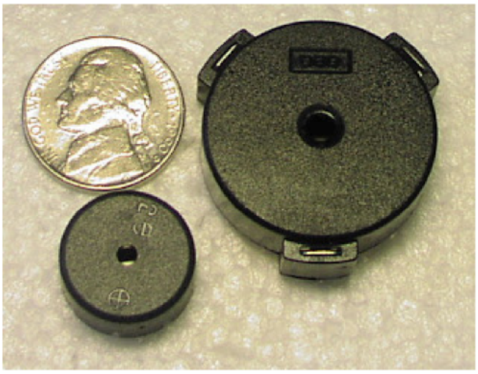
Author : L. Libertin - Copyright : Elektor



S1a: Fire Brigade S1b: Police S1c: Ambulance

FREE SCHEMATICS

3V Sweeping Siren Alarm

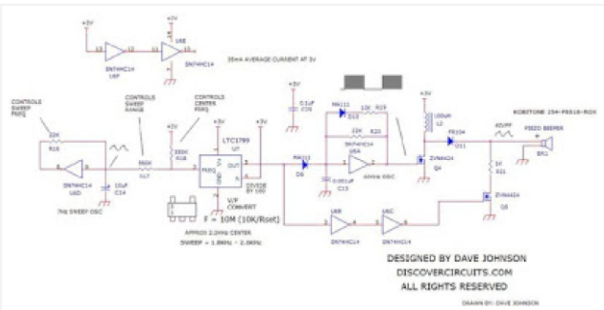


A while back I was challenged by a visitor to the website. He needed a very loud sweeping siren type audio sound generator powered by 3v. He tried some of the commercial sirens but they were not very loud when powered by 3v. He also said that those devices demanded much higher current than he wanted to use. I gave this problem some thought and came up with a design below.

The circuit uses a LTC1799 precision frequency generator from Linear Technology. A 74HC14 hex Schmitt trigger from Texas Instruments is also used to perform several other functions. One section is wired as a simple 7Hz square wave oscillator. The triangle waveform across that capacitor generates the low frequency sweeping signal for the siren. Two resistors bias the LTC1799 for a center frequency of about 2KHz. A flyback DC to DC converter circuit, produces a 40v peak signal, which is turned on and off according to the output of the LTC1799.

The output is connected to a quality piezoelectric beeper, which has a resonant frequency of about 2.5KHz. The result is a siren which is quite loud but draws only 40ma from a 3v supply. A piezoelectric device from Kobitone, part number 254-PB515-ROX, (Mouser part number 245-PB516) shown above works well. If you want something much smaller, although not quite as loud, try the Murata PKM17EPP-2002-BO shown above (Digikey part number 490-4688).

Click on Schematic below to view PDF version of this Circuit



3v-SweepingSiren

Labels: 3V Sweeping Siren Alarm

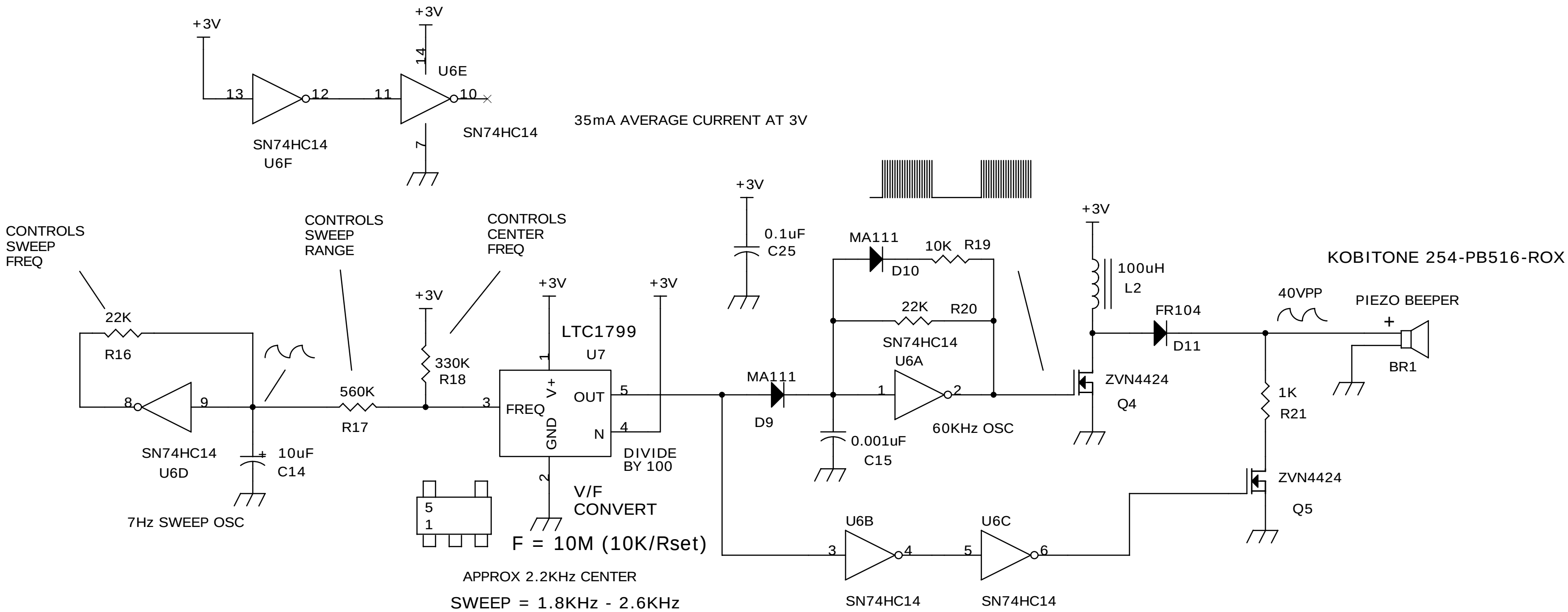
0 COMMENTS:

Post a Comment

- صيانة شاشات lg بالاسكندرية

LABELS

- 1.5v LED FLASHER (2)
- 1.5v to 9v INVERTER (1)
- 110 dB Beeper (1)
- 12v RELAY ON 6V SUPPLY (1)
- 12v TRICKLE CHARGER (1)
- 12v zener diode (1)
- 2 Line Mixer (1)
- 3 Tone Gong (1)
- 3V Sweeping Siren Alarm (1)
- 3V Tube Amplifier Schematic (1)
- 4 channels mixer (1)
- 4-Way Intercom (1)
- 555 timer circuit (3)
- 5V power supply (2)
- 5v REGULATED SUPPLY FROM 3V (1)
- 6 Headphone Splitter Schematic (1)
- 6 MILLION GAIN (1)
- Adjustable power supply (3)
- AM FM Antenna Booster (1)
- amplificador operacional (1)
- amplifier KP904 (1)
- amplifiers tube (2)
- audio AMPLIFIER (14)
- Audio line driver (1)
- Automatic cooler fan for amplifiers (1)
- BATTERY CHARGER SCHEMATIC (1)
- BENCH POWER SUPPLY (1)
- BlackBerry (2)
- Broadband Colpitts VCO for TV Tuner (1)
- car (1)
- circuit diagrams (3)
- Circuit Guitar Tabs (1)
- class d audio amplifier (1)
- COLPITTS OSCILLATOR (1)
- CONSTANT CURRENT SOURCE (1)
- crystal radio parts (1)
- DANCING FLOWER (1)
- datasheet (27)
- datasheet microcontroller (1)



DESIGNED BY DAVE JOHNSON

DISCOVERCIRCUITS.COM

DRAWN BY: DAVE JOHNSON

Title: VERY LOUD SWEEPING SIREN SOUND GENERATOR		
Size: B	Document Number: 3VSWEEPINGSIREN1.DSN	Rev: A
Date: Tuesday, June 24, 2008	Sheet 1 of 1	

Multi-tone Configurable Alarm

Presented here is a multi-tone configurable alarm that can be activated by temperature and other physical parameters. -- Petre Tzv. Petrov

April 1, 2014

Presented here is a multi-tone configurable alarm that can be activated by temperature and other physical parameters. Its output tone can be selected through different switch combinations. Such an alarm is highly desirable when multiple alarms are present in the same area. Different tones can be selected for different alarms so that you can easily know which alarm has triggered. The alarm in this circuit is activated by temperature.

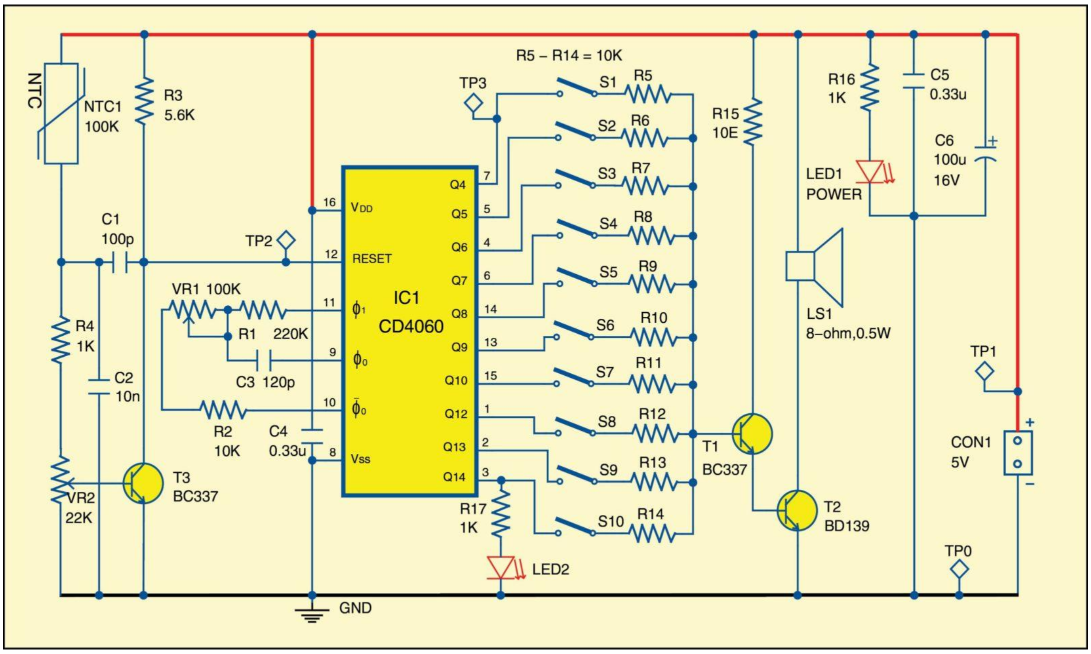
Circuit and working

Test Points

Test point	Details
TP0	GND
TP1	5V
TP2	Low when NTC1 is hot
TP3	Square wave (frequency depends on VR1)

CD4060 (IC1) is a CMOS integrated circuit that contains an oscillator and a 14-stage ripple counter/divider. It has three oscillator terminals (1, 0 and 0), ten buffered outputs of the counter (Q4-Q10 and Q12-Q14) and an active 'high' master reset. It is used in this project to produce ten different square waves at the same time. These square waves can be mixed to produce different output tones using switches (S1-S10).

The oscillator frequency mainly depends on the value of components C3, R2, R1 and VR1. If needed, oscillator frequency can be trimmed using potmeter VR1. Trimming is useful to obtain different clock frequencies when several alarms are in use near each other. If trimming is not needed, VR1 can be replaced with a fixed-value resistor.



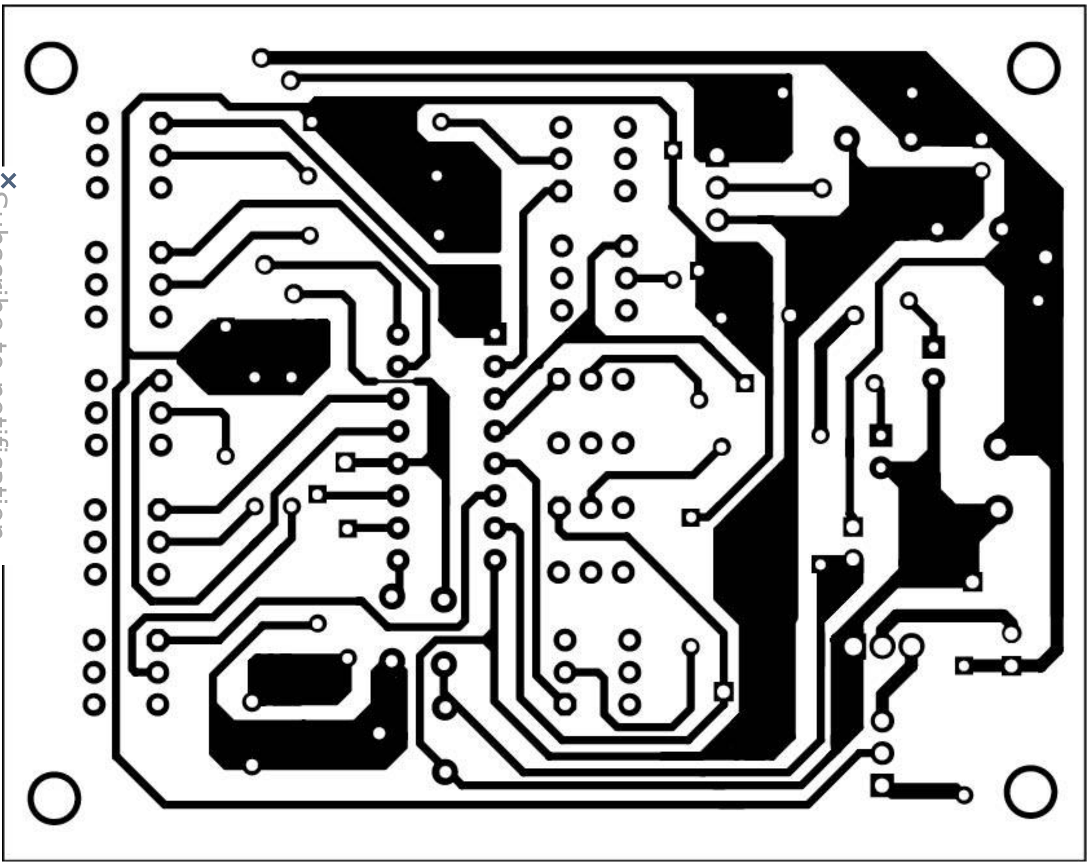
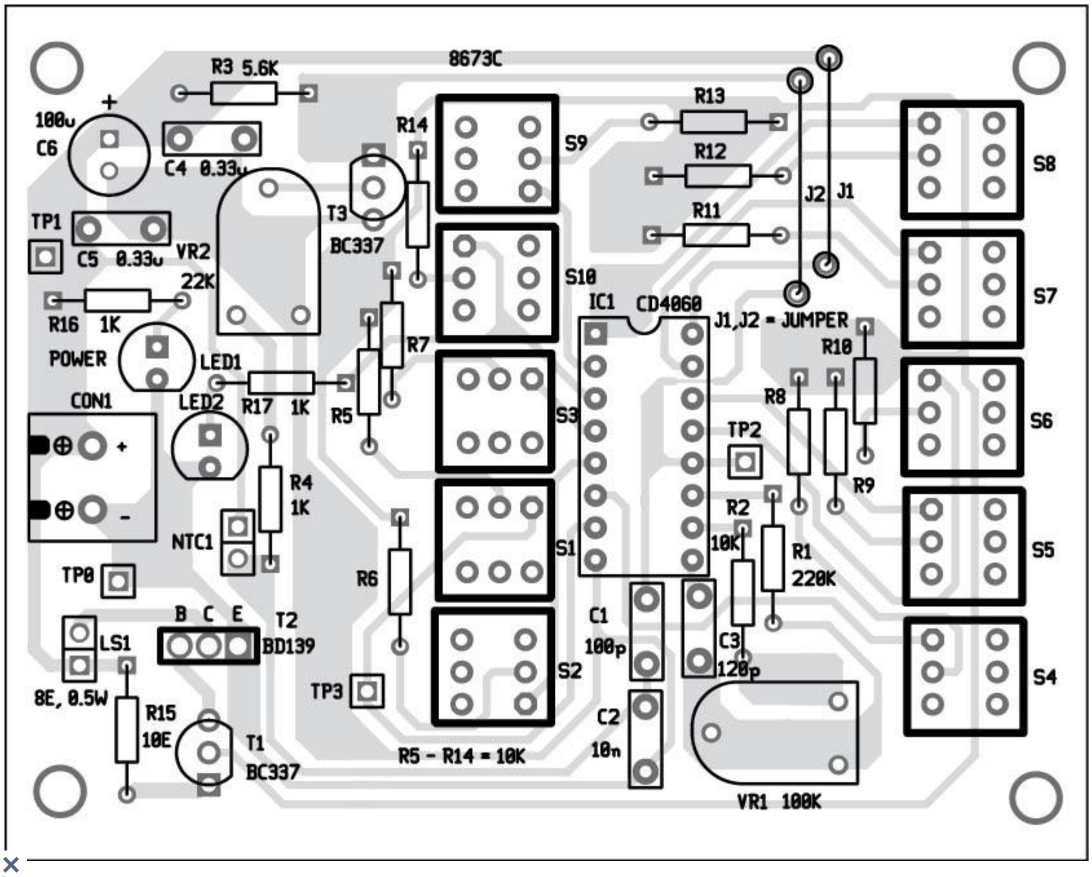


Fig. 2: An actual-size, single-side PCB for multi-tone configurable alarm



ı. 3: Component layout for the PCB

ownload PCB and component layout PDFs: click here

'ith increasing temperature, resistance of thermistor NTC1 decreases and the asing voltage for transistor T3 increases. Once it reaches beyond the threshold ıtablished with VR2, transistor T3 conducts and reset pin 12 of IC1 goes 'low.'

The make of NTC1 is not critical but VR2 should have an appropriate value depending on the selected NTC. The counter in IC1 starts advancing with rise in temperature and square-wave signals start appearing on the outputs. Through push-to-on switches S1-S10 you may select the frequencies required in the audio alarm signal. The produced composite signal available at the base of transistor T1 is amplified to drive loudspeaker LS1. The mixed multi-tone signal produced is generally difficult to ignore.

Though 5V power supply is recommended here, the circuit works with 2V to 6V. Also, CD4060 may be replaced with 74HCT4060 or 74HC4060 for IC1. LED1 indicates the presence of power supply, and resistor R16 is for current limiting.

Construction and testing

An actual-size, single-side PCB for the alarm is shown in Fig. 2 and its component layout in Fig. 3. After assembling the circuit on a PCB, enclose it in a suitable plastic case. Fix 2-pin terminal block connector CON1 on the PCB for power supply. Connect NTC1 through external wires for temperature sensing. fix potmeters VR1 and VR2 on the front panel for frequency control and threshold level settings.

The author was a researcher and assistant professor in Technical University of Sofia (Bulgaria) and an expert-lecturer in Kingdom of Morocco. Now he is working as an electronics engineer in the private sector in Bulgaria

Multitone Siren

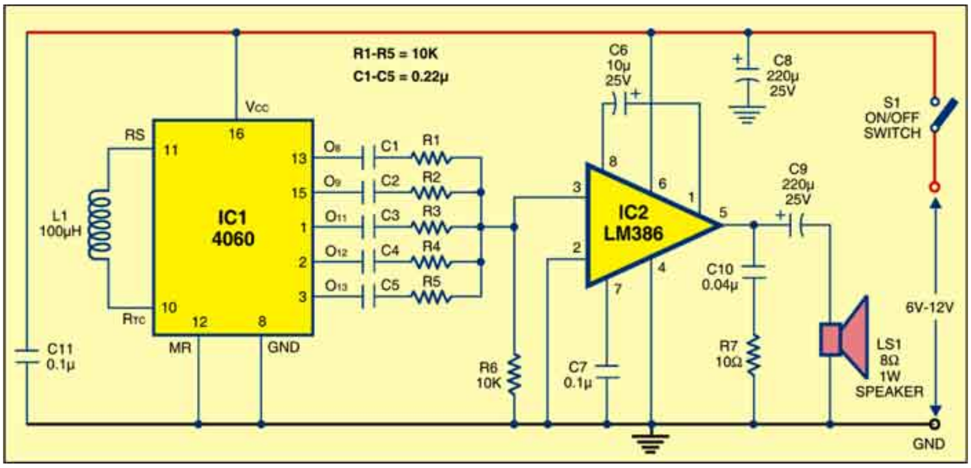
By Pradeep G.

February 5, 2018

This multitone siren is useful for burglar alarms, reverse horns, etc. It produces five different audio tones and is much more ear-catching than a single-tone siren.

A multitone siren circuit

The circuit is built around popular CMOS oscillator-cum-divider IC 4060 and small audio amplifier LM386. IC 4060 is used as the multitone generator. A 100 µH inductor is used at the input of IC 4060. So it oscillates within the range of about 5MHz RF. IC 4060 itself divides RF signals into AF and ultrasonic ranges. Audio signals of different frequencies are available at pins 1, 2, 3, 13 and 15 of IC 4060 (IC1). These multifrequency signals are mixed and fed to the audio amplifier built around IC LM386.



circuit of the multitone siren

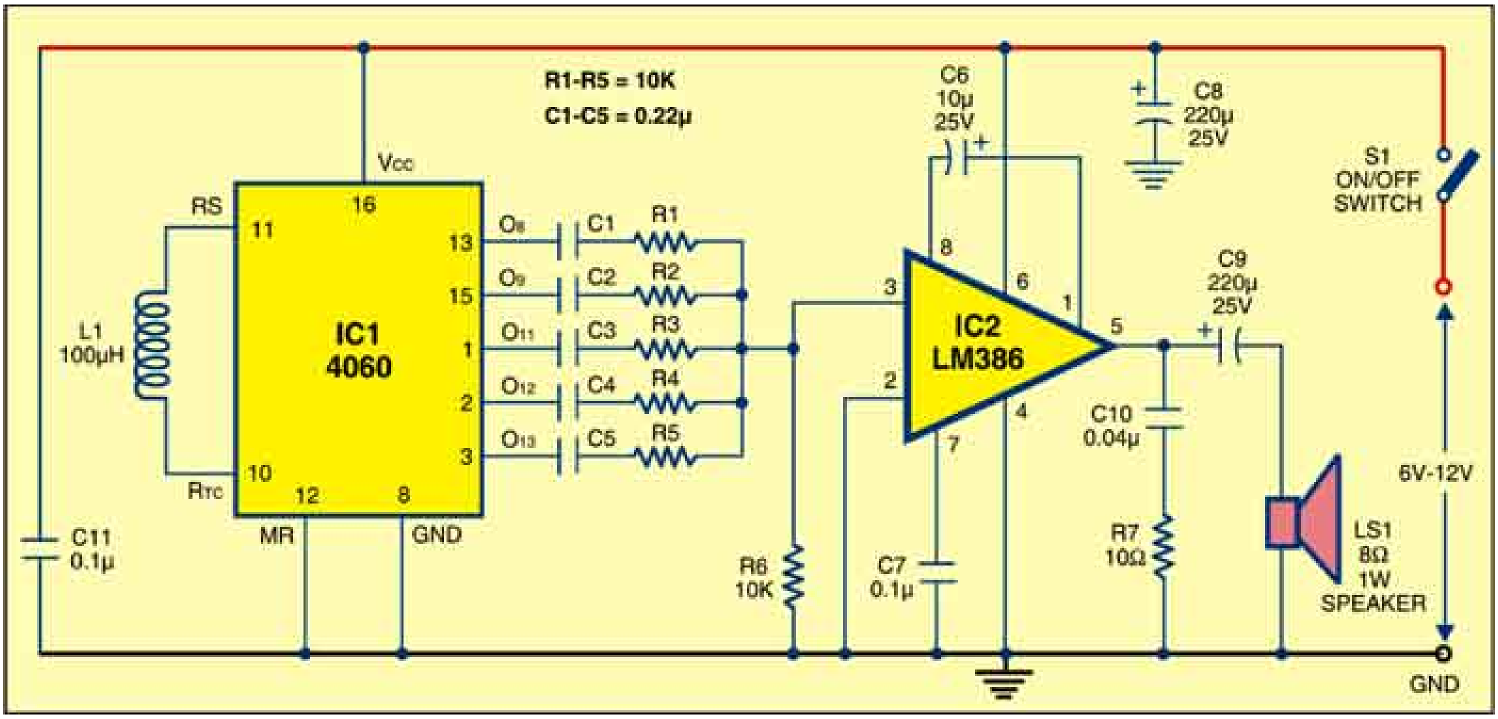
The output of IC2 is fed to the speaker through capacitor C9. If you want louder sound, use power amplifier TBA810 or TDA1010.

Only five outputs of IC1 are used here as the other five outputs (pins 4 through 7 and 14) produce ultrasonic signals, which are not audible.

Construction & testing

Assemble the circuit on a general-purpose PCB and enclose in a suitable cabinet. Regulated 6V-12V (or a battery) can be used to power the circuit.

The project was first published in May 2011 and has recently been updated.

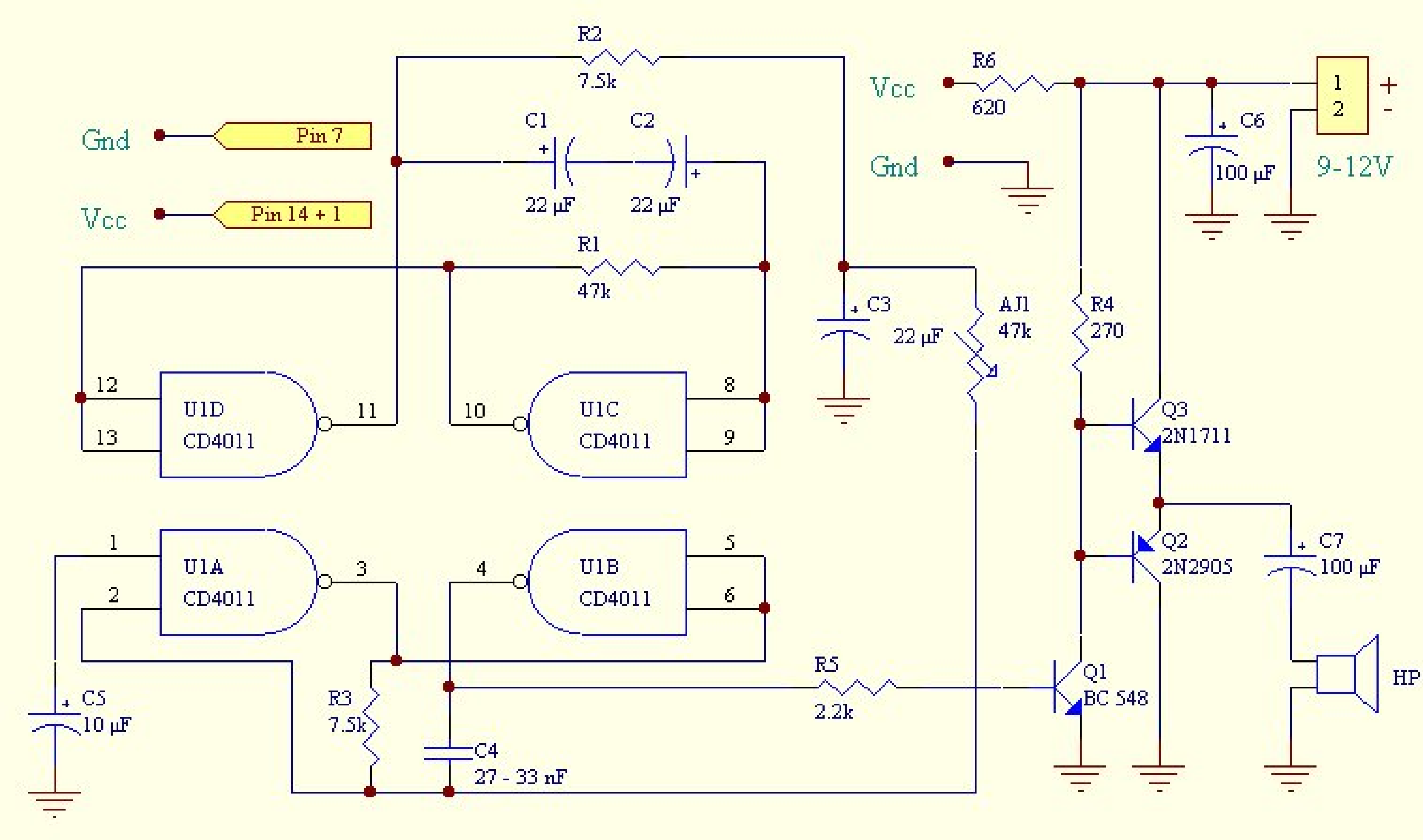

R1-R5 = 10K
C1-C5 = 0.22µ
IC1
4060
IC2
LM386
L1
100µH
RS
RTC
VCC
MR
GND
O8
O9
O11
O12
O13
C1
C2
C3
C4
C5
R1
R2
R3
R4
R5
R6
10K
C6
10µ
25V
C7
0.1µ
C8
220µ
25V
C9
220µ
25V
C10
0.04µ
R7
10Ω
C11
0.1µ
S1
ON/OFF
SWITCH
6V-12V
LS1
8Ω
1W
SPEAKER
GND

Sirene moyenne puissance pour alarme :

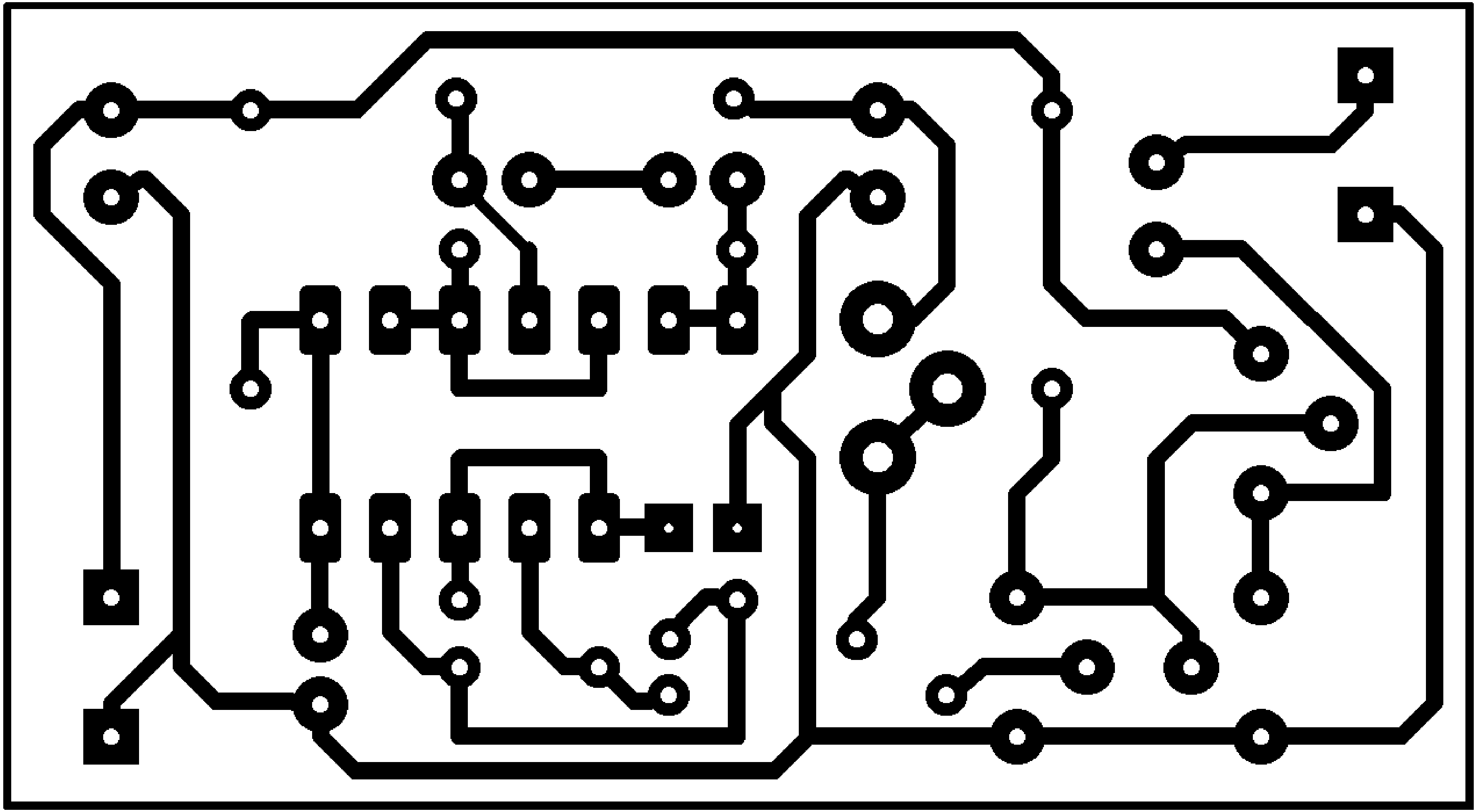
Fichiers :

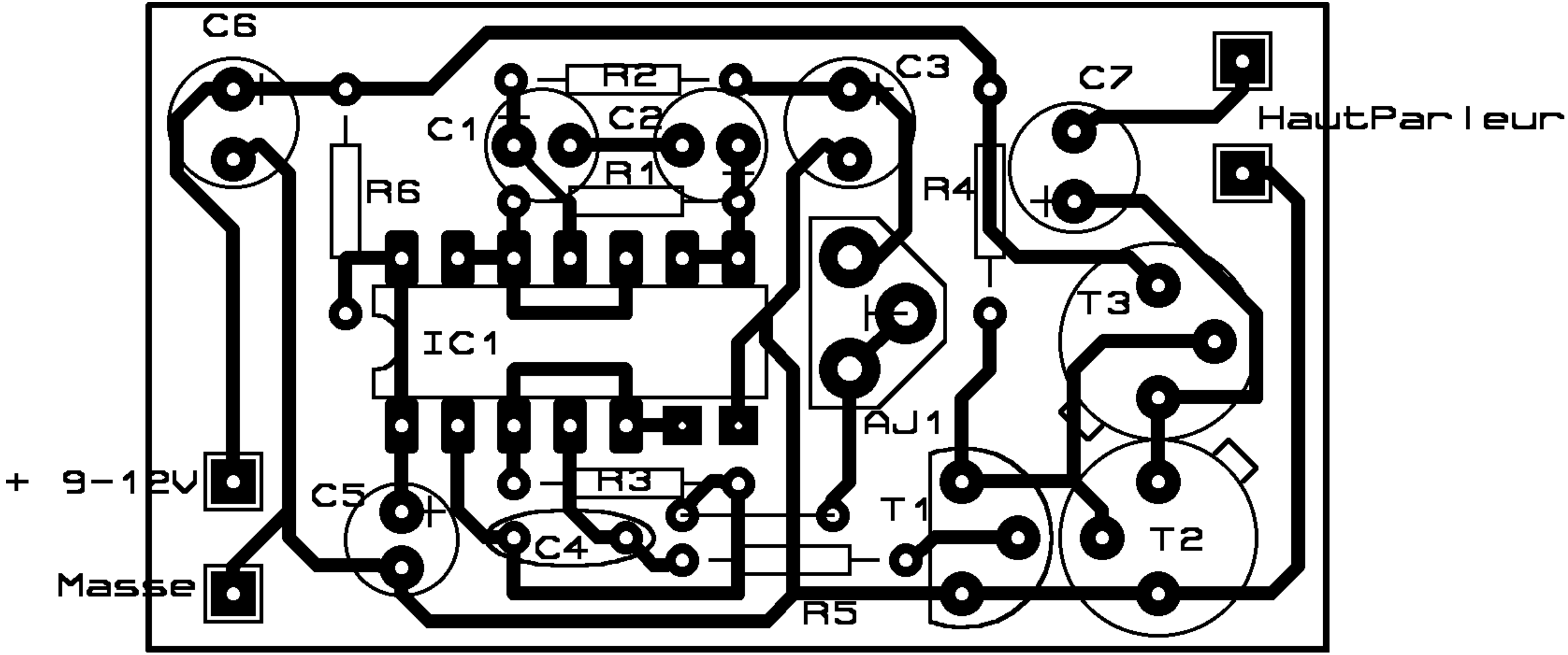
- schema.sch : protel98 SCH, schema
- schema.jpg : schema
- typon.bmp : typon
- implant.bmp : implantation des composants
- implant+typon.lyt : typon + implantation format Areslite (www.multipower-fr.com)

++++++++++++++++++++



R2
7.5k
C1
C2
22 µF
22 µF
Gnd
Pin 7
Vcc
Pin 14 + 1
R1
47k
R6
620
Vcc
Gnd
C6
100 µF
9-12V
1
2
+
-
C3
22 µF
AJ1
47k
R4
270
12
13
U1D
CD4011
11
10
U1C
CD4011
8
9
Q3
2N1711
Q2
2N2905
C7
100 µF
1
2
U1A
CD4011
3
4
U1B
CD4011
5
6
HP
R5
2.2k
Q1
BC 548
C5
10 µF
R3
7.5k
C4
27 - 33 nF





C6
R2
C3
C7
HautParleur
C1
C2
R1
R6
R4
IC1
T3
AJ1
+ 9-12V
R3
C5
T1
C4
T2
Masse
R5

5 Simple Siren Circuits you can Build at Home

LAST UPDATED ON SEPTEMBER 6, 2021 BY SWAGATAM (HTTPS://WWW.HOMEMADE-CIRCUITS.COM/AUTHOR/SWAG/)

In this post we learn about a 5 simple siren circuits, using **Arduino** and also with ordinary components such as transistors and capacitors yet is able to produce an alarm sound at an excruciating level.

The idea was contributed by "Abu-Hafss"

Deeper in the article we also learn to make an advanced Arduino based design with adjustable and customizable tone features.

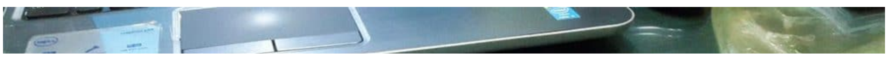
1) The Design

This simple car siren circuit design explained here uses minimum number components and yet is able to produce an ear piercing alarm sound each time it's switched ON.

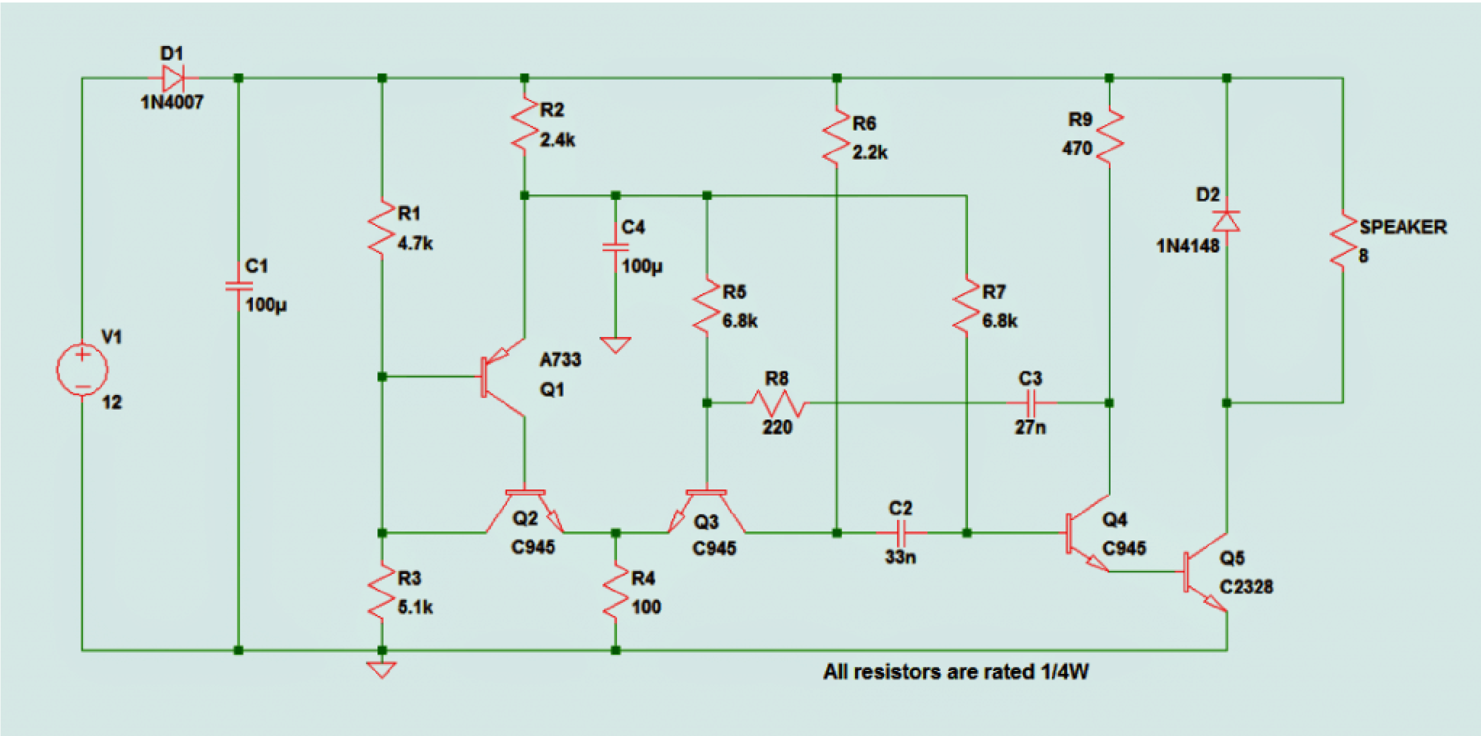
The device is normally used as a car reverse horn, although it can used for any other relevant application too, depending upon the user's preference.

In the automobile field this siren is also popularly know as the "Mega Siren" due to the massive decibel level it generates.

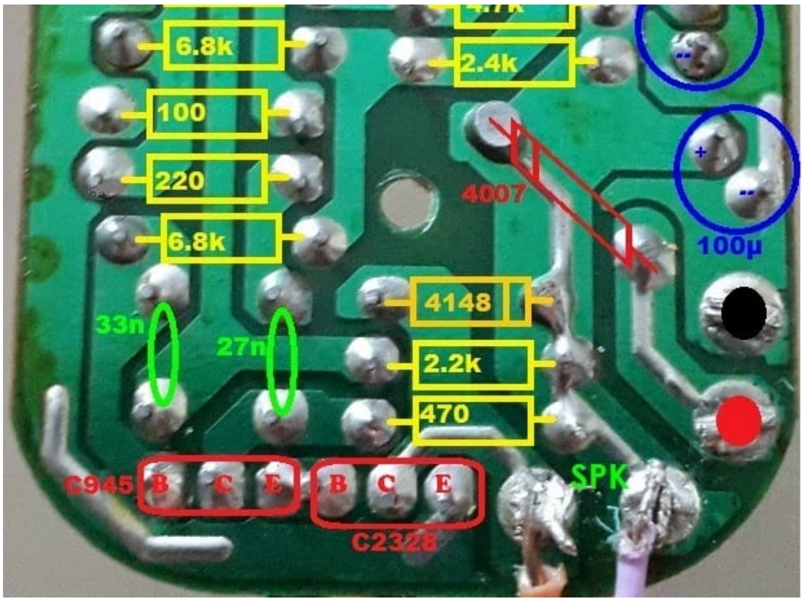
The schematic details and other related info of the proposed car siren is presented below,which were furnished by Mr. Abu-Hafss, who is one of the dedicated readers and contributor of this blog.



Circuit Diagram



PCB Layout



The following request was also attached with the above files in the email from Mr. Abu-Hafss.

Dear Swagatam Attached,

please find a photo of a car 12V-20W siren which has really ear-piercing sound. I opened it and found a small PCB as attached.

I have interpreted the PCB into schematic as attached. My concern is to use the amplifier section for some other 15-20W application.

Frankly, I do not have practical experience of audio amplifiers. I shall highly appreciate your help in this regard.

Best regards

Abu-Hafss

As per the above request, the amplifier section of the car siren is cheap and powerful (@ 20watts) and possibly could be used as an amplifier module for other applications requiring a cheap but powerful amplifier alternative.

Analyzing the The Design

Studying the given diagram it appears that the stage comprising Q4, Q5 is only responsible for the amplification, the remaining sections are for generating the siren frequency for the Q4, Q5 base.

The stage forms a powerful Darlington transistor amplifier stage with an extremely high gain (in the order of 1000 and more)

Since the amplifier design is too basic, it might not be suitable for generating or handling Hi-fi music or frequencies above 4kHz.

Moreover the transistor in the process could dissipate a significant amount of heat causing the consumption to be higher than the normal Hi-fi amplifiers.

Therefore, although the amplifier incorporated in the above car siren circuit is cheap and simple it cannot be efficiently implemented for producing movie songs and melodies which involve frequencies up to 15kHz. However, it can be effectively used in units such as horns, bells, alarms, security systems etc.

2) Generating Siren Sound with Arduino

The following Arduino based siren sound generator circuit can be used for generating the pitch perfectly imitating a typical siren sound and can be customized to produce many different siren effects simply by making relevant modification in the sketch.

A siren sound, as we all know is a loud noise generated through a device designed for producing this sound either through a mechanical approach or through electronic circuits.

Siren sound generator devices find many useful applications and are used in emergency service vehicles like in police and ambulance vehicles, and also in fire brigades etc.

The discussed configurable siren enables a connected speaker to produce a custom siren sound. Basically there are two types of siren sound generating equipment, viz pneumatic and electronic.

Pneumatic systems employ air pressure forced through an appropriately dimensioned pipe for creating the sound, while electronic equipment are more sophisticated, using loudspeakers or piezo devices for generating the relevant sound at any desired rate and pattern. Electronic sirens are more flexible, customizable and offer more variations and are extremely efficient.

Types of Siren Sound

A Siren sound can be of many different types, a few common types are the police, ambulance, and the fire siren, others could be in the form of mega sirens as used in car horns, (https://www.homemade-circuits.com/2015/08/car-siren-circuit.html) some are fast police siren tunes, another type could be ear piercing such as used for neutralizing mobs, a few could be in your cell phone for alerting while a new message is received.

Therefore, the range could be too extensive and the proposed Arduno alarm circuit can be customized as per the users personal wish and preference for achieving the wished siren sound.

Code sketch:

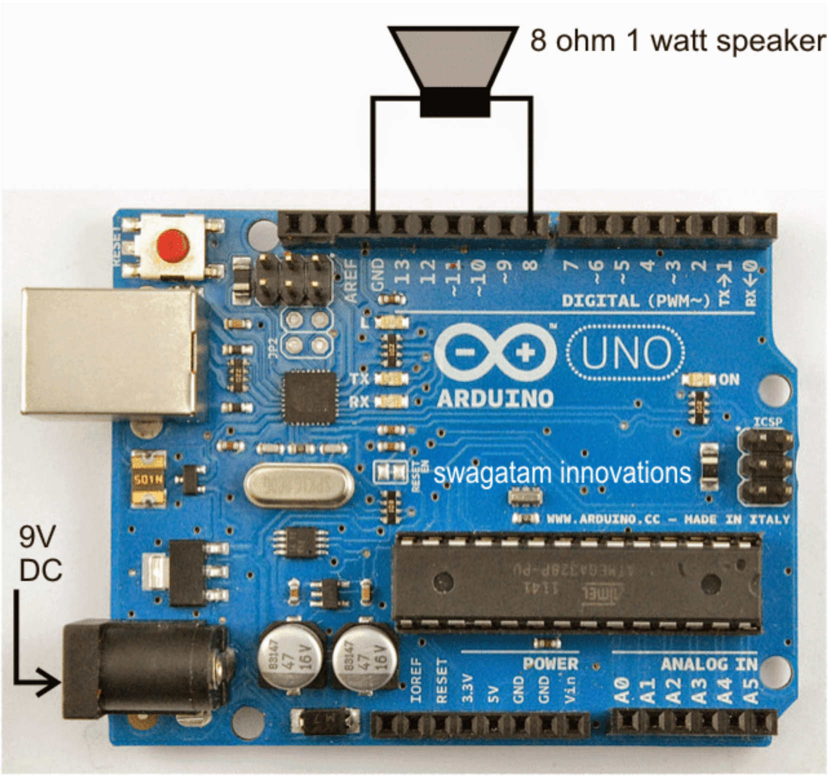
/*
Siren

A configurable siren for Arduino, requires an 8-ohm speaker attached to
pin8 and ground. For high amplification use a transistor driver with pin8

```
//Copyright (c) 2012 Jeremy Fonte
//This code is released under the MIT license
//https://opensource.org/licenses/MIT
const int pitchLow = 200;
const int pitchHigh = 1000;
int pitchStep = 10;
int currentPitch;
int delayTime;
const int speakerPin = 8;
void setup() {
currentPitch = pitchLow;
delayTime = 10;
}
void loop() {
tone(speakerPin, currentPitch, 10);
currentPitch += pitchStep;
if(currentPitch >= pitchHigh) {
pitchStep = -pitchStep;
}
else if(currentPitch <= pitchLow) {
pitchStep = -pitchStep;
```

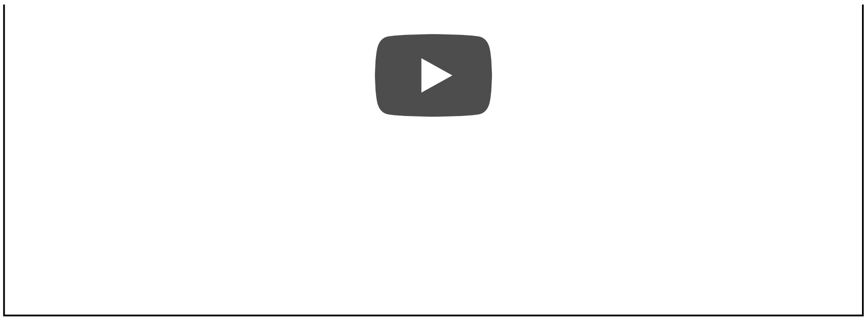
```
pitchStep = -pitchStep;
}
delay(delayTime);
}
```


Arduino Wiring Diagram with Speaker and Supply Input



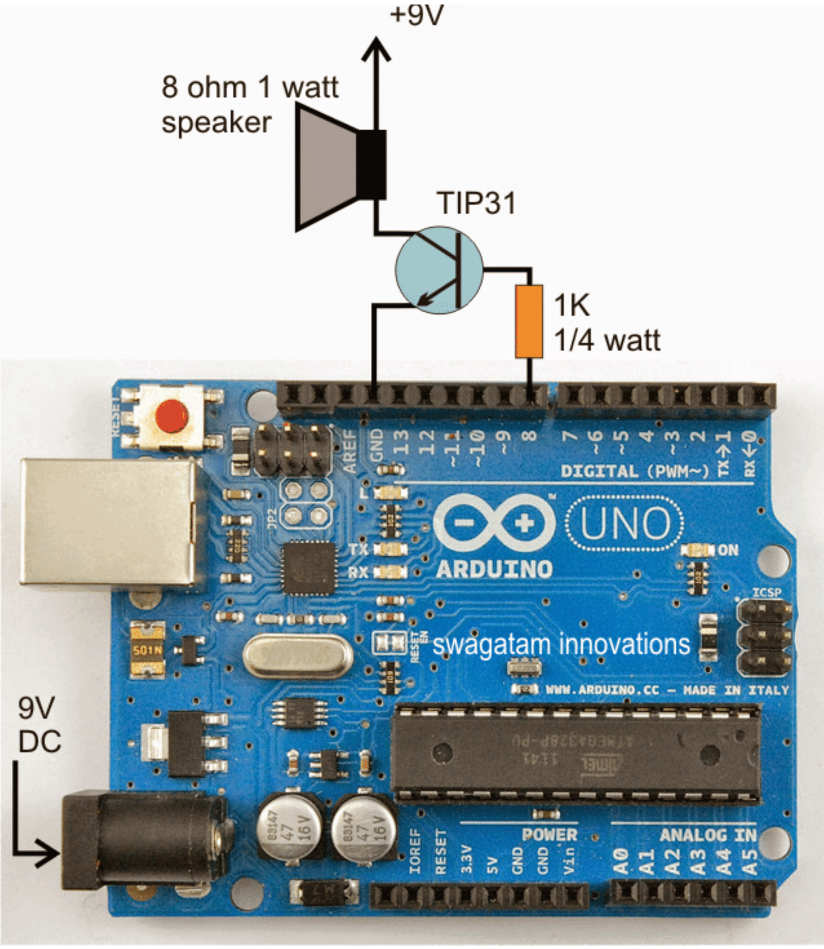
Video Demo:

Simple Arduino Siren Circuit



Using a BJT Stage for Greater Amplification

For high amplification, the above set up can be modified as per the folowng connection diagram:



Modifying the Code

Upon Testing I fund the siren sound from the Arduino not very pleasant, and had slight distortions. I experimented with the code, and finally made it extremely smooth and pleasant to hear. Here's the improved for you:

```
//Improved by Swagatam

const int pitchLow = 200;
const int pitchHigh = 1000;
```

```
const int pitchHigh = 1000;
int pitchStep = 10;
int currentPitch;
int delayTime;
const int speakerPin = 8;
void setup() {
currentPitch = pitchLow;
delayTime = 5;
}
void loop() {
tone(speakerPin, currentPitch, 20);
currentPitch += pitchStep;
if(currentPitch >= pitchHigh) {
pitchStep = -pitchStep;
}
else if(currentPitch <= pitchLow) {
pitchStep = -pitchStep;
}
delay(delayTime);
}
```

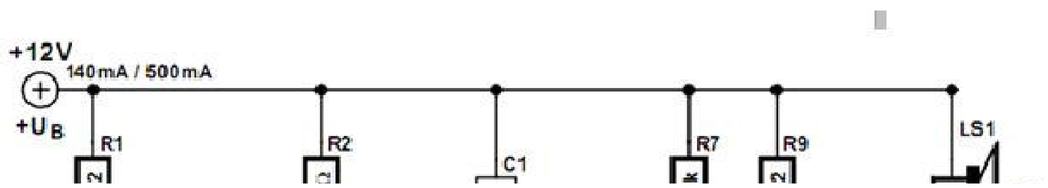
You can also play with the `const int pitchHigh = 1000;`and increase to to 2000 for increasing the siren length, which is relevant to police sirens.

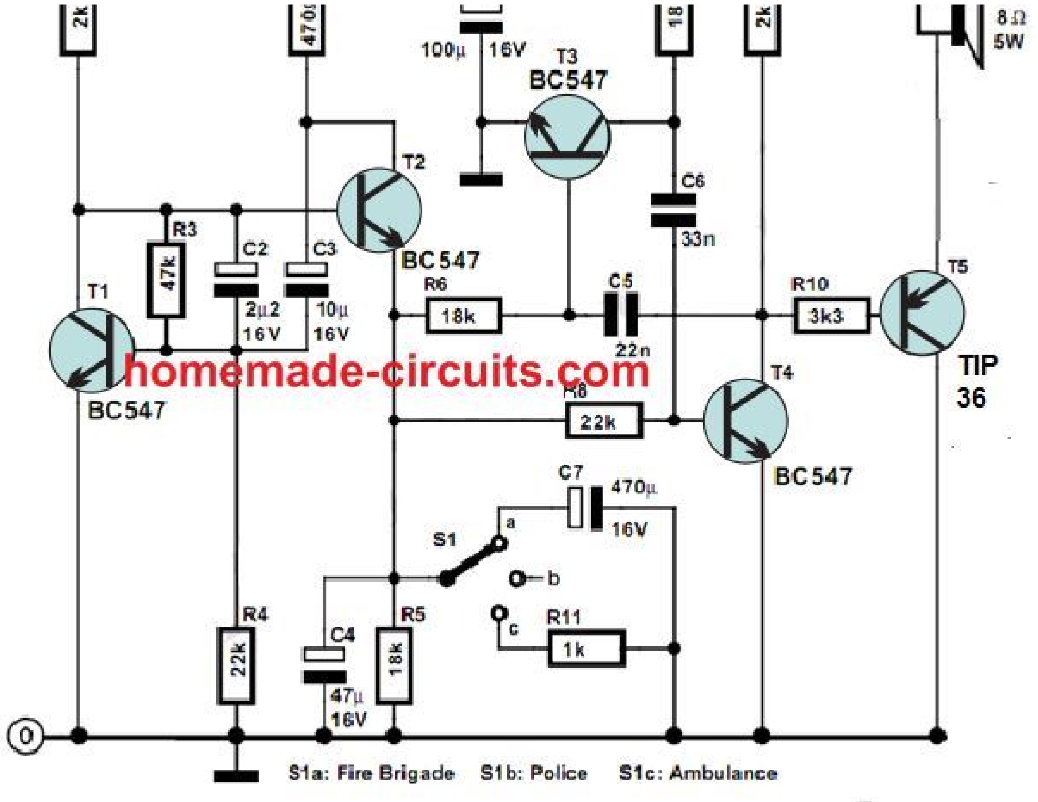
3) Police, Ambulance, Fire Brigade Siren - USA Style

The next siren circuit is a 3-in-1 siren, which will produce 3 distinct tones resembling, police siren (https://www.homemade-circuits.com/police-ambulance-siren-circuit-with-rotating-beacon-light/), ambulance siren, and fire brigade sirens sound.

These can be selected through a 3 pole switch, and simply by toggling the positions of the switch.

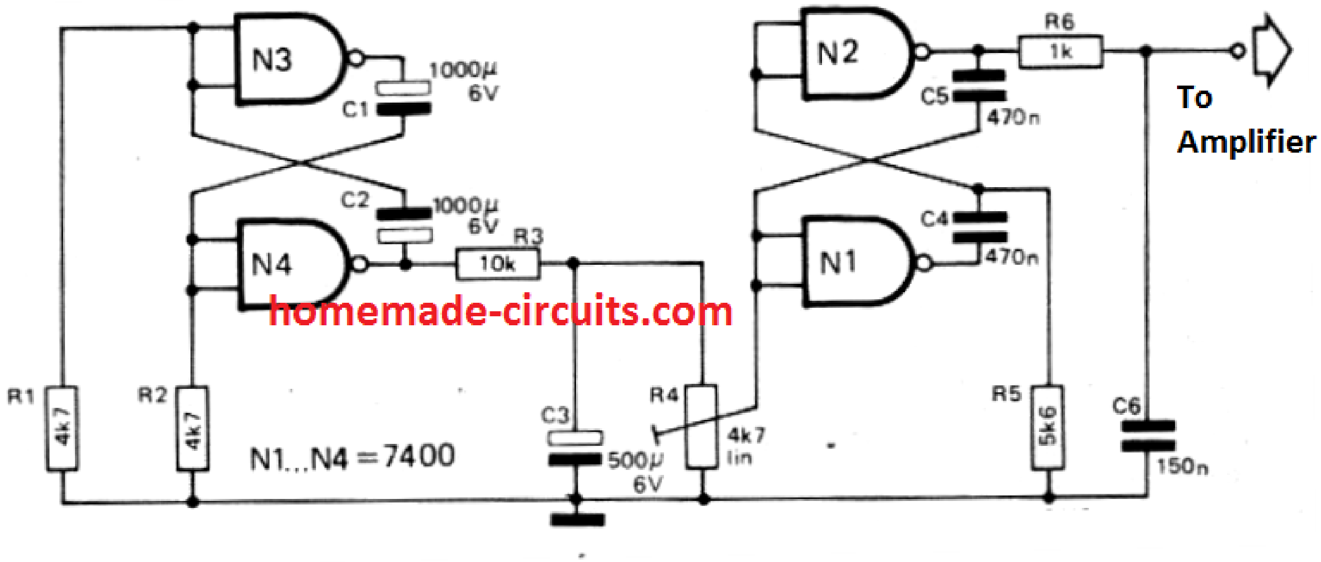
The complete circuit diagram for this 3 in 1 siren circuit is furnished below:





4) Siren Using IC 7400

Here's another simple and cheap siren using the IC 7400 (https://www.homemade-circuits.com/simple-circuits-using-ic-7400-nand-gates/) that can be used for many different alarm applications.

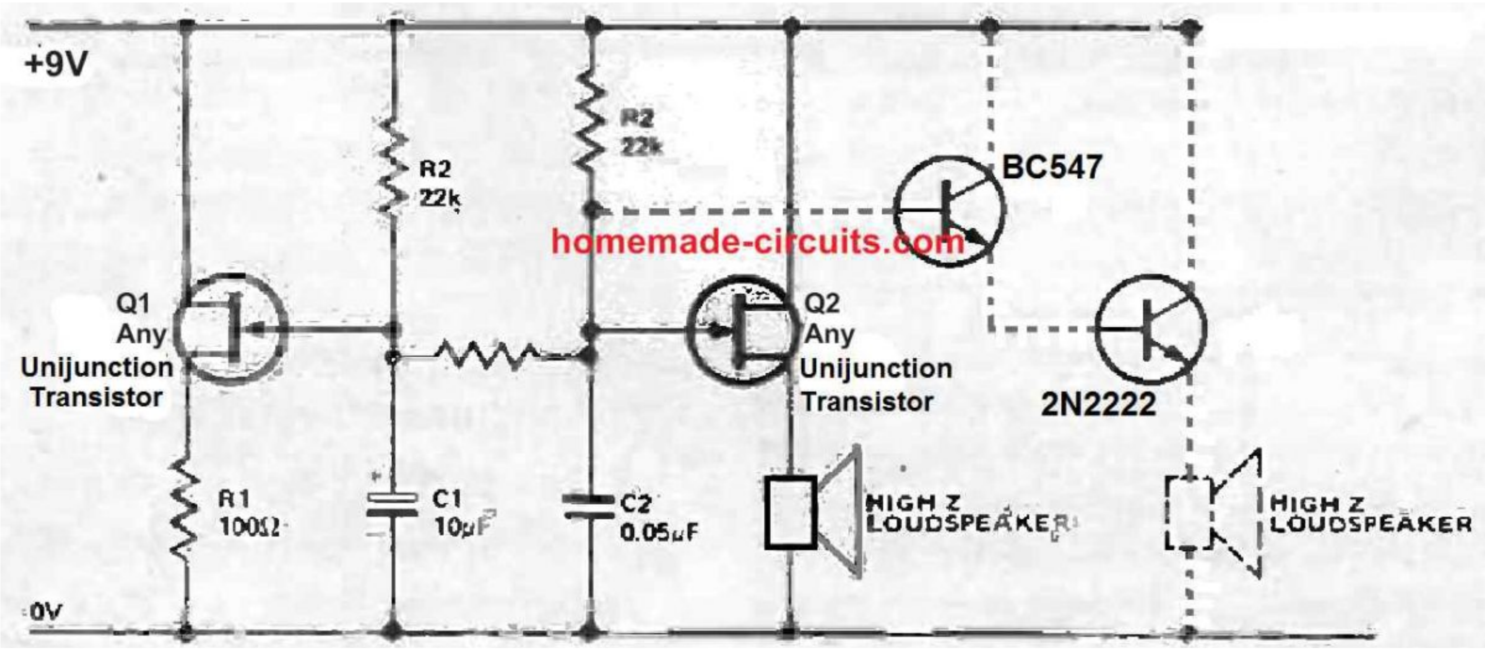


The circuit basically is configured around two astable multivibrators, N1/N2 and N3/N4. The N1/N2 stage generates a 0.2 Hz square wave signal which is coupled to the N3/N4, which causes an up and down swing of the 0.2 Hz.

The resulting siren output is 2 V peak to peak and can be amplified any suitable amplifier for getting a loud siren sound.

5) Siren Circuit using Unijunction Transistors

The indicated loud siren circuit is made up of a pair of unijunction relaxation oscillators (https://www.homemade-circuits.com/10-simple-unijunction-transistor-ujtapplication-circuits/). UJT Q1 is configured to generate low frequency while Q2 is wired to produce audio frequency.



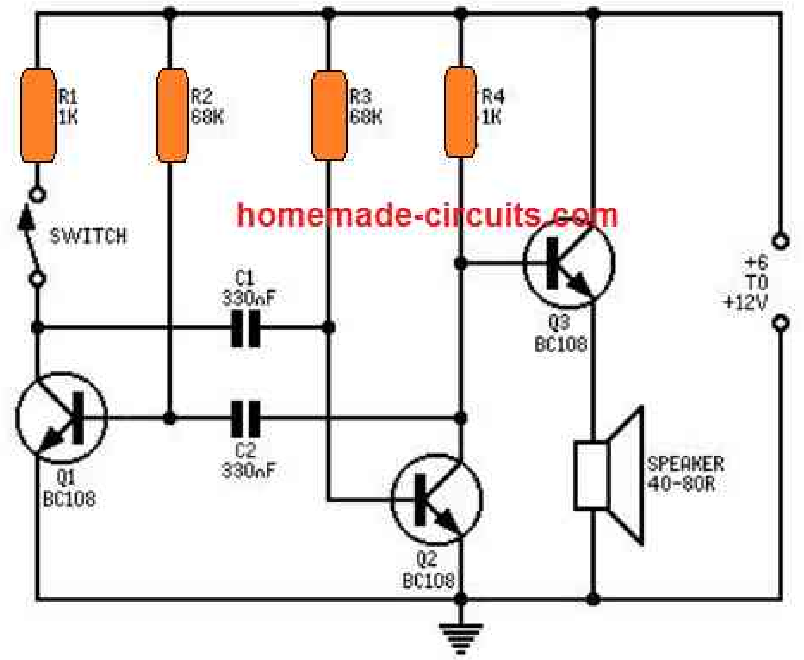
Resistor R3 connects the slow rising voltage over C1, decided by the time constant components C1 and R2, with the audio frequency across C2, established by the time constant of C2 and R4. The combination results an output where the audio frequency created by Q2 increases in pitch due to the application of the slow rising voltage across

C1. This is applied through the resistor R3 to the time constant network C2/R4. This generated siren sound due to sharp intensity is able to travel a longer distances away compared to simple continuous siren sounds generated through just one oscillator.

If you want additional amplification you can accomplish it by integrating a couple of transistors in a super-alpha Darlington set up, as indicated in the dotted circuit stage. R4 resistor shown at the center, must be substituted with a 100 ohm 1/4W resistor. Hooked up to some pressure mat (through over C2), this specific UJT siren circuit could form a fantastic baby snatch alarm for strollers.

6) Ship Siren Circuit

This circuit will generate a high pitched sound just like a ship's siren. The design works well using the low power output source for model ships, when the output signal is appropriately amplified through a power amplifier, to produce a loud ship like alarm tone.



The circuit is configured around a multivibrator through the transistors Q1 & Q2, and a low power output stage using the transistor Q3. The indicated speaker is required to have an impedance of around 40 to 80 ohms.

Capacitors C1 and C2 are responsible for the pitch intensity of the siren and with the values shown in the diagram, the pitch of the siren can be approximately around 300Hz.

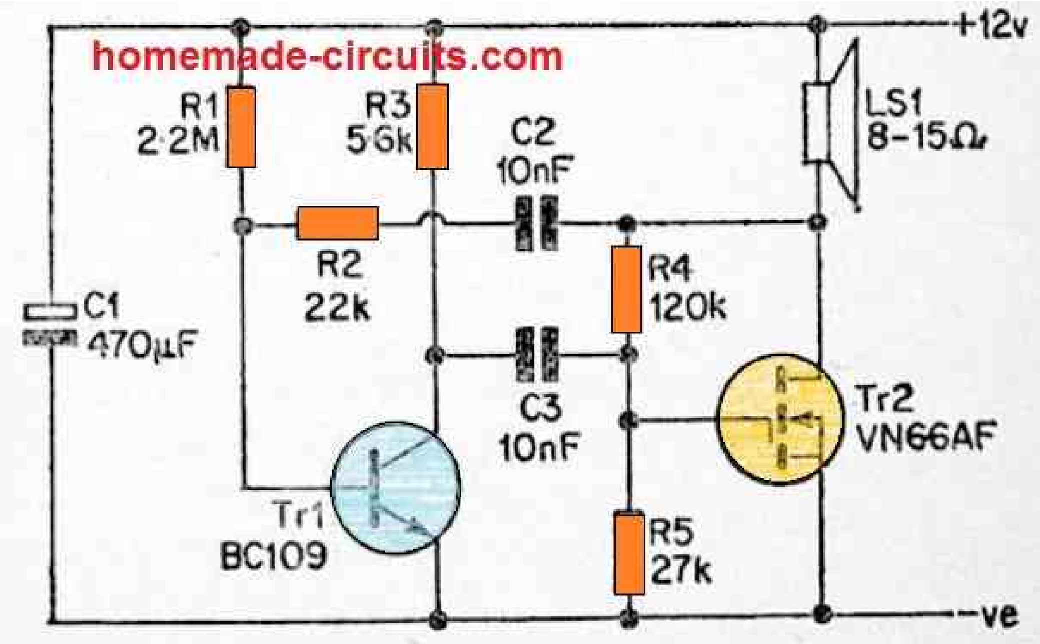
The Quiescent current of the circuit is quite low and can be ignored. If you wish to have a much more powerful ship siren sound, in that case you can integrate the Q2 collector output with an external amplifier input through a 1μF electrolytic, in series with a 12k resistor.

High Power MOSFET Siren

The next concept shows a simple yet powerful MOSFET based siren circuit.

Tr1 is utilized as a common emitter circuit, with R2 as the collector load and R1 providing base biasing. C3 connects the output of Tr1's collector to Tr2's input (gate terminal). Tr1's base operates in phase with Tr2's collector, and both Tr1 and Tr2 produce an inversion of the signal. As a result, C2 and R3 offer positive feedback, and the circuit's gain is big enough to create powerful oscillation.

and the circuit's gain is big enough to create powerful oscillation.

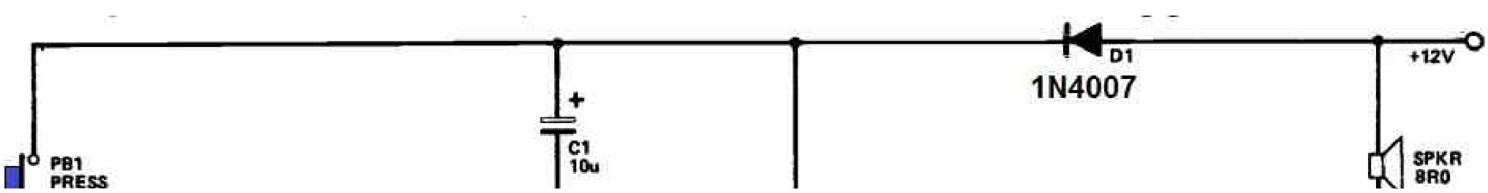


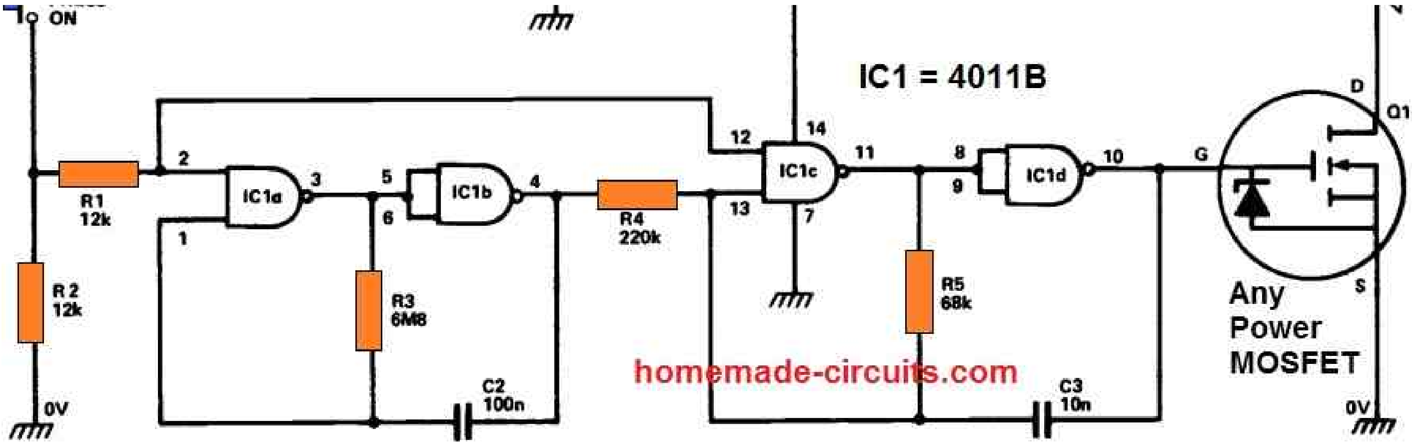
The MOSFET shown in the diagram can be replaced with IRF540

The drain terminal of the MOSFET Tr2 receives an approximately squarewave signal, and the device is turned between hard on and hard off states. This causes very large current pulses (about 500 mA peak) to be pushed to the loudspeaker, resulting in a very loud siren tone output. The working frequency is around 1kHz, however it may be adjusted by changing C2 and C3 values. Varying their values can create an oppositely proportionate change in the oscillating frequency, therefore make sure C2 and C3 have identical vaues.

10 watt Power Siren

This ingenious small design makes use of the most recent developments in semiconductor technology to create a very compact, low-cost, yet extremely powerful alarm-sound generating unit that can be simply integrated into an existing intruder alarm system or equivalent "protection" equipment. The alarm circuit includes a basic alarm-signal generating stage, which is accompanied by a power amplifier stage. The alarm-signal component of the machine is built around a low-cost CMOS integrated circuit that uses almost no "standby" power.





The power amplifier circuit is a true cutting-edge technology, a low-cost MOSFET power FET that uses almost no current while in "standby" mode. As a result, there is no need for a discrete on/off switch, and the device may be left completely linked to a 12 volt battery supply. IC1a and IC1b are wired as slow astable multivibrators, whereas IC1c-IC1d are connected as fast astables. Each of these astables are "gated," meaning they may be switched on and off using PB1.

The ICa-IC1b slow astable's output is applied to control the frequency of the 1C1c-IC1d fast astable, and the fast astable's output is supplied to the external speaker through the Q1 MOSFET power amplifier stage. When PB1 is open, each of the astables and Q1 are inactive, and the circuit draws almost little standby current. D1 and C1 are utilized to guarantee that voltage spikes produced into the battery supply connections through the speaker do not have a detrimental effect on the astable operations. It should be noted that the circuit requires an 8 Ohm speaker rated to handle higher than 10 watts.

You'll also like:

1. Simple Kitchen Timer Circuit – Egg Timer (https://www.homemade-circuits.com/simple-kitchen-timer-circuit-egg-timer/)

2. Cellphone Controlled Car Starter Circuit (https://www.homemade-circuits.com/cellphone-controlled-car-starter-circuit/)

3. Car Blown Brake Light Indicator Circuit to Detect Broken Bulb Filament Tail Light (https://www.homemade-circuits.com/car-fused-brake-light-bulb-indicator/)

circuits.com/car-fused-brake-light-bulb-indicator/)

4. Infrared Controlled Car Door Lock (https://www.homemade-circuits.com/infrared-controlled-car-door-lock/)
5. Using Single Switch for Fog lamp and DRL Lamp (https://www.homemade-circuits.com/use-single-switch-for-fog-lamp-and-drl-leds/)
6. Darkness Triggered Car Safety Park Light Circuit (https://www.homemade-circuits.com/darkness-triggered-car-safety-park/)

About Swagatam

I am an electronic engineer (dipIETE), hobbyist, inventor, schematic/PCB designer, manufacturer. I am also the founder of the website: https://www.homemade-circuits.com/, where I love sharing my innovative circuit ideas and tutorials.

If you have any circuit related query, you may interact through comments, I'll be most happy to help!

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(https://www.homemade-circuits.com/disclaimer/)

Comments

Abu-Hafss says

August 25, 2015 at 4:04 pm (https://www.homemade-circuits.com/car-siren-circuit/#comment-33485)

Hi Swagatam

I intend to use the amplifier only for horns & alarms made by using 555.

Please see the attached schematic. Is it correct or do I need to test the values for the resistor and capacitor?

https://dl.dropboxusercontent.com/u/20969135/Screenshot%202015-08-25%2020.58.55.png (https://dl.dropboxusercontent.com/u/20969135/Screenshot%202015-08-25%2020.58.55.png)

REPLY

Swagatam says

August 26, 2015 at 6:25 am (https://www.homemade-circuits.com/car-siren-circuit/#comment-33497)

Hi Abu-Hafss,

It looks OK to me, but a resistor in place of C2 would be more appropriate according to me….the value can be anything between 1K and 10K.

REPLY

Bubai says

September 8, 2015 at 10:23 am (https://www.homemade-circuits.com/car-siren-circuit/#comment-33826)

Dear Swagatam Da,
I constructed the circuit (image link s14.postimg.org/kgqpm8jpt/siren_circuit.jpg)
according to the schematic as well as according to the PCB but found no sound in 1.5w 8ohm speaker.

Please post a circuit similar to the sound heard in youtube in this topic.

REPLY

Swagatam says

September 8, 2015 at 1:44 pm (https://www.homemade-circuits.com/car-siren-circuit/#comment-33829)

Dear Bubai,

as you can see in the post, the circuit was taken from a working model and produced exactly as is in the original unit…. so it should work according to me original unit….so it should work according to me.

check all the components and the tracks carefully once again, you might have done something incorrect while assembling.

the sound clip was recorded from the original piece presented above.

REPLY

Unknown says

October 2, 2015 at 9:25 am (https://www.homemade-circuits.com/car-siren-circuit/#comment-34512)

Is that a normal speaker or a piezo buzzer? It seems to me that the speaker is not a magnetic coil speaker. To receive any sound you might have to use a powerful buzzer.

REPLY

Swagatam says

October 2, 2015 at 4:24 pm (https://www.homemade-circuits.com/car-siren-circuit/#comment-34524)

No, it's a loudspeaker, as we have in radios and TVs.

REPLY

Swagatam says

September 25, 2016 at 5:47 am (https://www.homemade-circuits.com/car-siren-circuit/#comment-44996)

you will need an inductor in parallel with the piezo wires…..you can wind 1000 turns of 36 SWG enameled copper wire over a ferrite drum for making the inductor

REPLY

7W AUDIO AMPLIFIER

NOT FOR NEW DESIGN

The TBS810P is an improvement of TBA810S.

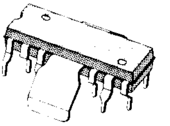
It offers:

- Higher output power (R_L = 4Ω and 2Ω)
- Low noise
- Polarity inversion protection
- Fortuitous open ground protection
- High supply voltage rejection (40dB min.)

The TBA810P is a monolithic integrated circuit in a 12-lead quad in-line plastic package, intended for use as a low frequency class B amplifier.

The TBA810P provides 7W output power at 16V/4Ω; 7W at 14.4/2Ω.

It gives high output current (up to 3A), high efficiency (75% at 60W output) very low harmonic and crossover distortion. The circuit is provided with a thermal limiting circuit and can withstand a short-circuit on the load for supply voltages up to 15V.



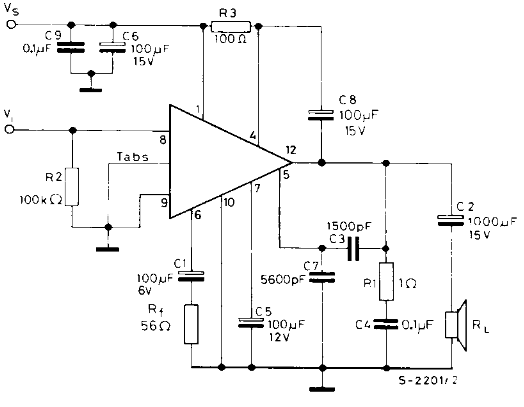
Findip

ORDER CODE: TBA810P

ABSOLUTE MAXIMUM RATINGS

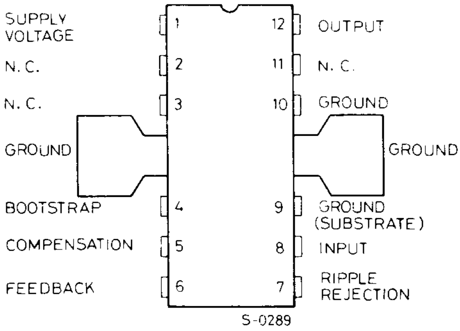
V_s	Supply voltage	20	V
I_o	Output peak current (non repetitive)	4	A
I_o	Output peak current (repetitive)	3	A
P_{tot}	Power dissipation at $T_{amb} \leq 80°C$	1	W
	$T_{tab} \leq 90°C$	5	W
T_{stg}, T_j	Storage and junction temperature	-40 to 150	°C

TEST AND APPLICATION CIRCUIT

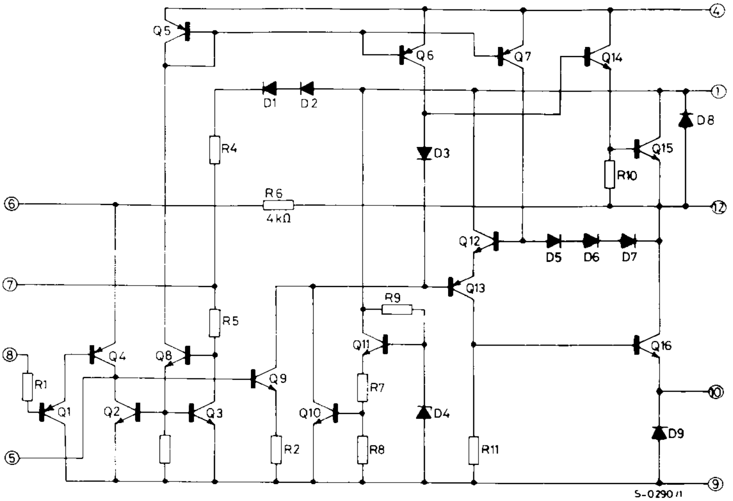


June 1988

CONNECTION DIAGRAM
(Top view)



SCHEMATIC DIAGRAM



THERMAL DATA

$R_{th\ j\text{-}tab}$	Thermal resistance junction-tab	max	12	°C/W
$R_{th\ j\text{-}amb}$	Thermal resistance junction-ambient	max	70*	°C/W

* Obtained with tabs soldered to printed circuit with minimized copper area

ELECTRICAL CHARACTERISTICS (Refer to the test circuit; V_s = 14.4V, T_{amb} = 25°C unless otherwise specified)

Parameter		Test Conditions	Min.	Typ.	Max.	Unit
V_s	Supply voltage (pin 1)		4		20	V
V_o	Quiescent output voltage (pin 2)		6.4	7.2	8	V
I_d	Quiescent drain current			12	20	mA
I_b	Input bias current			0.4		μA
P_o	Output power	d = 10% f = 1KHz R_L = 4Ω R_L = 2Ω	 5.5 5.5	 6 7		 W W
$V_{i\,(rms)}$	Input saturation voltage		220			mV
R_i	Input resistance (pin 8)			5		MΩ
B	Frequency response (-3dB)	R_L = 4Ω/2Ω C_3 = 820pF C_3 = 150pF	 40 to 20,000 40 to 10,000			 Hz Hz
d	Distortion	P_o = 50mW to 2.5W R_L = 4Ω/2Ω f = 1KHz		0.3		%
G_v	Voltage gain (open loop)	R_L = 4Ω f = 1KHz		80		dB
G_v	Voltage gain (closed loop)	R_L = 4Ω/2Ω f = 1KHz	34	37	40	dB
e_N	Input noise voltage	V_s = 16V B (-3dB) = 40 to 15,000Hz		2		μV
i_N	Input noise current	V_s = 16V B (-3dB) = 40 to 15,000Hz		80		pA
η	Efficiency	P_o = 6W R_L = 4Ω f = 1KHz		75		%
SVR	Supply voltage rejection	R_L = 4Ω V_{ripple} = 1V_{rms} f_{ripple} = 10Hz	40	48		dB

Fig. 1 - Output power vs. supply voltage

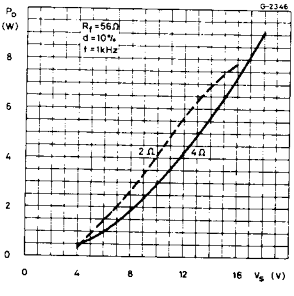


Fig. 2 - Maximum power dissipation vs. supply voltage (sine wave operation)

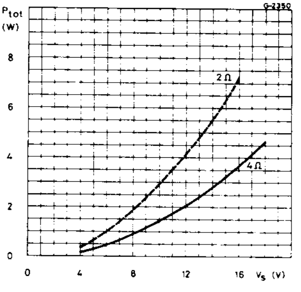
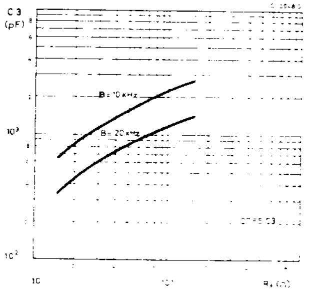


Fig. 3 - Value of C3 vs. feedback resistance for various values of B



INTEGRATED CIRCUITS

DATA SHEET

TDA1010A
6 W audio power amplifier in car applications
10 W audio power amplifier in mains-fed applications

Product specification
File under Integrated Circuits, IC01

November 1982

Philips Semiconductors

PHILIPS

6 W audio power amplifier in car applications
10 W audio power amplifier in mains-fed

TDA1010A

The TDA1010A is a monolithic integrated class-B audio amplifier circuit in a 9-lead single in-line (SIL) plastic package. The device is primarily developed as a 6 W car radio amplifier for use with 4 Ω and 2 Ω load impedances. The wide supply voltage range and the flexibility of the IC make it an attractive proposition for record players and tape recorders with output powers up to 10 W.

Special features are:

- single in-line (SIL) construction for easy mounting
- separated preamplifier and power amplifier
- high output power
- low-cost external components
- good ripple rejection
- thermal protection

QUICK REFERENCE DATA

Supply voltage range	V_P		6 to 24	V
Repetitive peak output current	I_{ORM}	max.	3	A
Output power at pin 2; d_{tot} = 10%				
V_P = 14,4 V; R_L = 2 Ω	P_o	typ.	6,4	W
V_P = 14,4 V; R_L = 4 Ω	P_o	typ.	6,2	W
V_P = 14,4 V; R_L = 8 Ω	P_o	typ.	3,4	W
V_P = 14,4 V; R_L = 2 Ω; with additional bootstrap resistor of 220 Ω between pins 3 and 4	P_o	typ.	9	W
Total harmonic distortion at P_o = 1 W; R_L = 4 Ω	d_{tot}	typ.	0,2	%
Input impedance				
preamplifier (pin 8)	$\lvert Z_i \rvert$	typ.	30	kΩ
power amplifier (pin 6)	$\lvert Z_i \rvert$	typ.	20	kΩ
Total quiescent current at V_P = 14,4 V	I_{tot}	typ.	31	mA
Sensitivity for P_o = 5,8 W; R_L = 4 Ω	V_i	typ.	10	mV
Operating ambient temperature	T_{amb}	–25 to + 150		°C
Storage temperature	T_{stg}	–55 to + 150		°C

PACKAGE OUTLINE

9-lead SIL; plastic (SOT110B); SOT110-1; 1996 Sepetember 06.

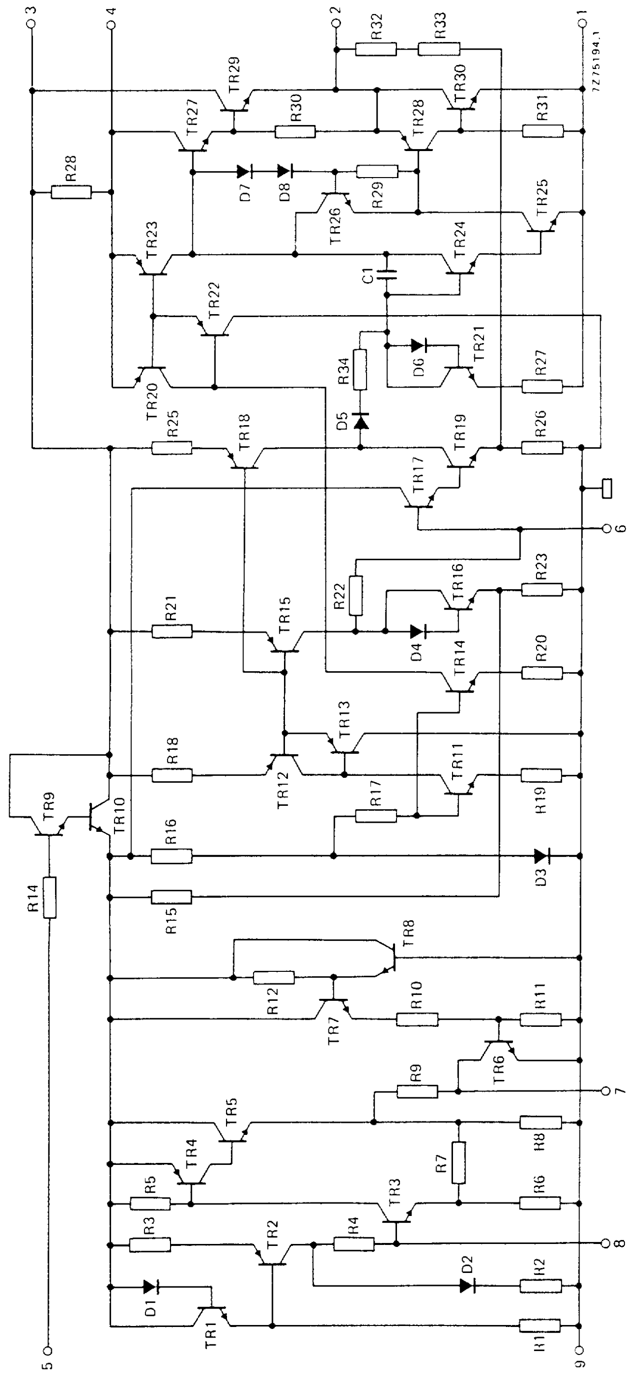


Fig.1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Supply voltage	V_P	max.	24	V
Peak output current	I_{OM}	max.	5	A
Repetitive peak output current	I_{ORM}	max.	3	A
Total power dissipation	see derating curve Fig.2			
Storage temperature	T_{stg}	–55 to +150		°C
Operating ambient temperature	T_{amb}	–25 to +150		°C
A.C. short-circuit duration of load during sine-wave drive; without heatsink at V_P = 14,4 V	t_{sc}	max.	100	hours

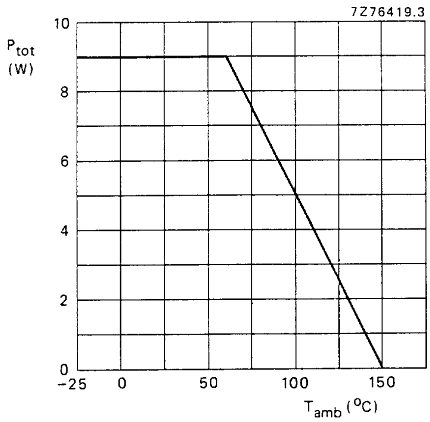


Fig.2 Power derating curve.

HEATSINK DESIGN

Assume V_P = 14,4 V; R_L = 2 Ω; T_{amb} = 60 °C maximum; thermal shut-down starts at T_j = 150 °C. The maximum sine-wave dissipation in a 2 Ω load is about 5,2 W. The maximum dissipation for music drive will be about 75% of the worst-case sine-wave dissipation, so this will be 3,9 W. Consequently, the total resistance from junction to ambient

$$R_{th\ j\text{-}a} = R_{th\ j\text{-}tab} + R_{th\ tab\text{-}h} + R_{th\ h\text{-}a} = \frac{150 - 60}{3,9} = 23\ \text{K/W}\ .$$

Since $R_{th\ j\text{-}tab}$ = 10 K/W and $R_{th\ tab\text{-}h}$ = 1 K/W,

$R_{th\ h\text{-}a}$ = 23 – (10 + 1) = 12 K/W.

D.C. CHARACTERISTICS

Supply voltage range	V_P		6 to 24	V
Repetitive peak output current	I_{ORM}	<	3	A
Total quiescent current at V_P = 14,4 V	I_{tot}	typ.	31	mA

A.C. CHARACTERISTICS

T_{amb} = 25 °C; V_P = 14,4 V; R_L = 4 Ω; f = 1 kHz unless otherwise specified; see also Fig.3.

A.F. output power (see Fig.4) at d_{tot} = 10%;				
measured at pin 2; with bootstrap				
V_P = 14,4 V; R_L = 2 Ω (note 1)	P_o	typ.	6,4	W
V_P = 14,4 V; R_L = 4 Ω (note 1 and 2)	P_o	>	5,9	W
		typ.	6,2	W
V_P = 14,4 V; R_L = 8 Ω (note 1)	P_o	typ.	3,4	W
V_P = 14,4 V; R_L = 4 Ω; without bootstrap	P_o	typ.	5,7	W
V_P = 14,4 V; R_L = 2 Ω; with additional bootstrap resistor of 220 Ω between pins 3 and 4	P_o	typ.	9	W
Voltage gain				
preamplifier (note 3)	G_{v1}	typ.	24	dB
			21 to 27	dB
power amplifier	G_{v2}	typ.	30	dB
			27 to 33	dB
total amplifier	$G_{v\ tot}$	typ.	54	dB
			51 to 57	dB
Total harmonic distortion at P_o = 1 W	d_{tot}	typ.	0,2	%
Efficiency at P_o = 6 W	η	typ.	75	%
Frequency response (–3 dB)	B		80 Hz to 15	kHz
Input impedance				
preamplifier (note 4)	$\lvert Z_i \rvert$	typ.	30	kΩ
			20 to 40	kΩ
power amplifier (note 5)	$\lvert Z_i \rvert$	typ.	20	kΩ
			14 to 26	kΩ
Output impedance of preamplifier; pin 7 (note 5)	$\lvert Z_o \rvert$	typ.	20	kΩ
			14 to 26	kΩ
Output voltage preamplifier (r.m.s. value)				
d_{tot} < 1% (pin 7) (note 3)	$V_{o(rms)}$	>	0,7	V
Noise output voltage (r.m.s. value; note 6)				
R_S = 0 Ω	$V_{n(rms)}$	typ.	0,3	mV
R_S = 8,2 kΩ	$V_{n(rms)}$	typ.	0,7	mV
		<	1,4	mV
Ripple rejection at f = 1 kHz to 10 kHz (note 7)	RR	>	42	dB
at f = 100 Hz; C2 = 1 μF	RR	>	37	dB
Sensitivity for P_o = 5,8 W	V_i	typ.	10	mV
Bootstrap current at onset of clipping; pin 4 (r.m.s. value)	$I_{4(rms)}$	typ.	30	mA

Notes

1. Measured with an ideal coupling capacitor to the speaker load.
2. Up to $P_o \leq 3$ W : $d_{tot} \leq 1\%$.
3. Measured with a load impedance of 20 kΩ.
4. Independent of load impedance of preamplifier.
5. Output impedance of preamplifier ($|Z_O|$) is correlated (within 10%) with the input impedance ($|Z_i|$) of the power amplifier.
6. Unweighted r.m.s. noise voltage measured at a bandwidth of 60 Hz to 15 kHz (12 dB/octave).
7. Ripple rejection measured with a source impedance between 0 and 2 kΩ (maximum ripple amplitude: 2 V).
8. The tab must be electrically floating or connected to the substrate (pin 9).

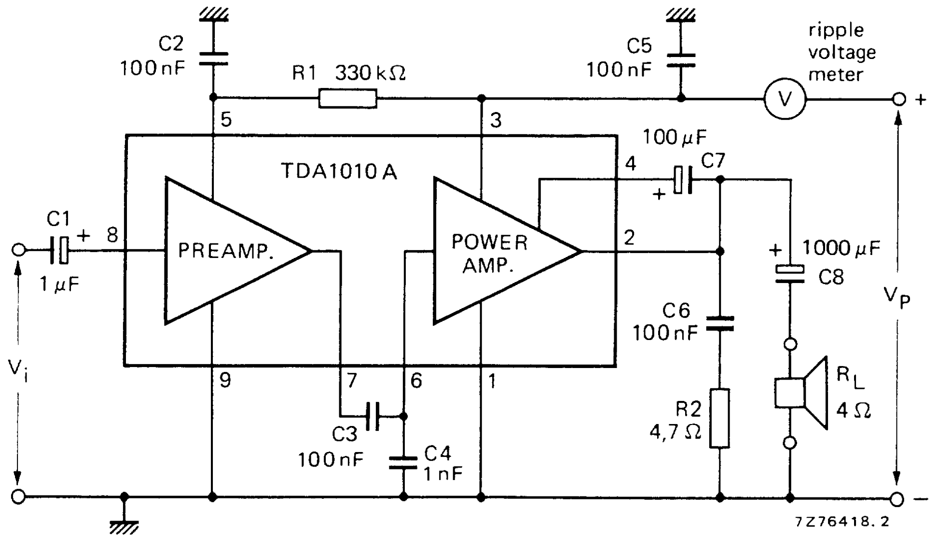


Fig.3 Test circuit.

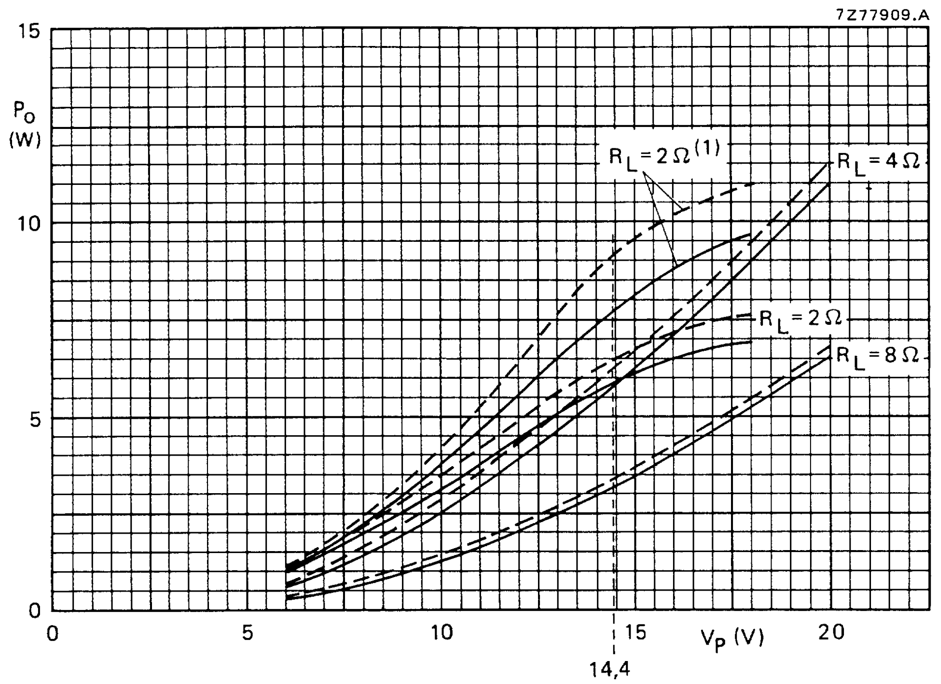


Fig.4 Output power of the circuit of Fig.3 as a function of the supply voltage with the load impedance as a parameter; typical values. Solid lines indicate the power across the load, dashed lines that available at pin 2 of the TDA1010. $R_L = 2\ \Omega^{(1)}$ has been measured with an additional 220 Ω bootstrap resistor between pins 3 and 4. Measurements were made at f = 1 kHz, d_{tot} = 10%, T_{amb} = 25 °C.

Fig. 5 See next page.
Total harmonic distortion in the circuit of Fig.3 as a function of the output power with the load impedance as a parameter; typical values. Solid lines indicate the power across the load, dashed lines that available at pin 2 of the TDA1010. $R_L = 2\ \Omega^{(1)}$ has been measured with an additional 220 Ω bootstrap resistor between pins 3 and 4. Measurements were made at f = 1 kHz, V_P = 14,4 V.

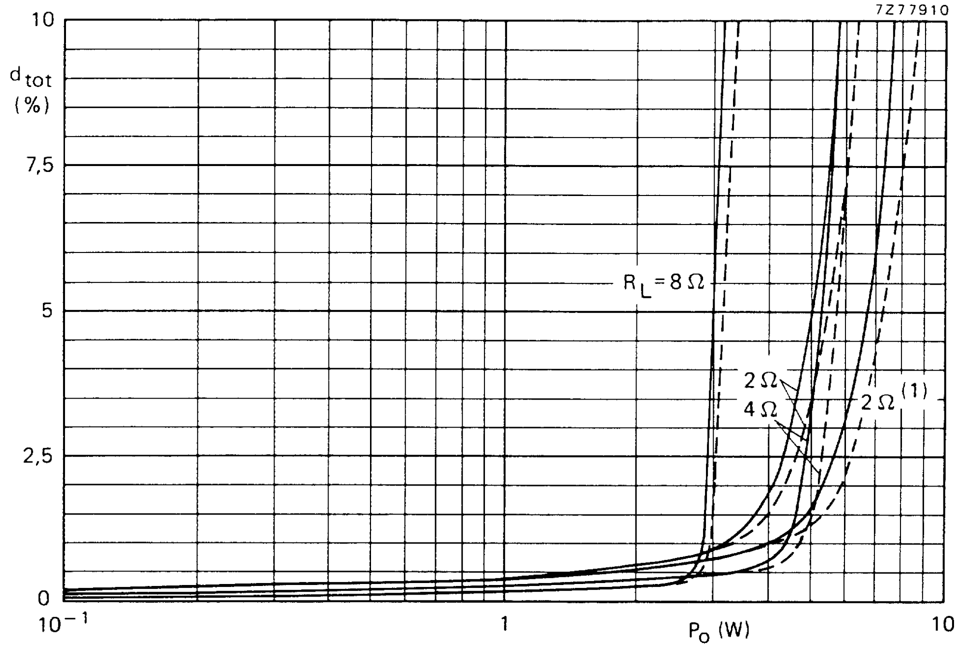


Fig.5 For caption see preceding page.

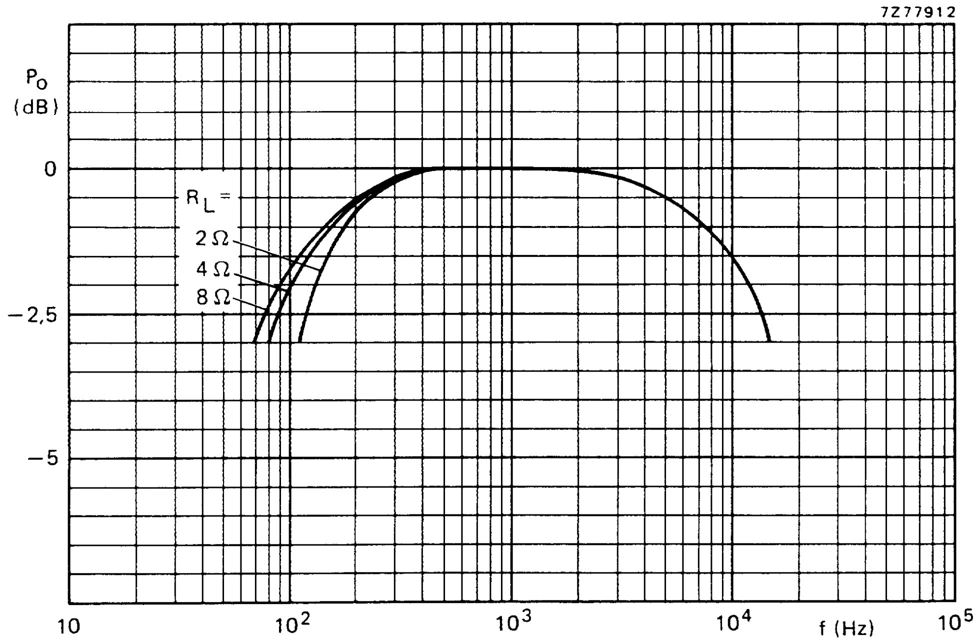


Fig.6 Frequency characteristics of the circuit of Fig.3 for three values of load impedance; typical values. P_o relative to 0 dB = 1 W; V_P = 14,4 V.

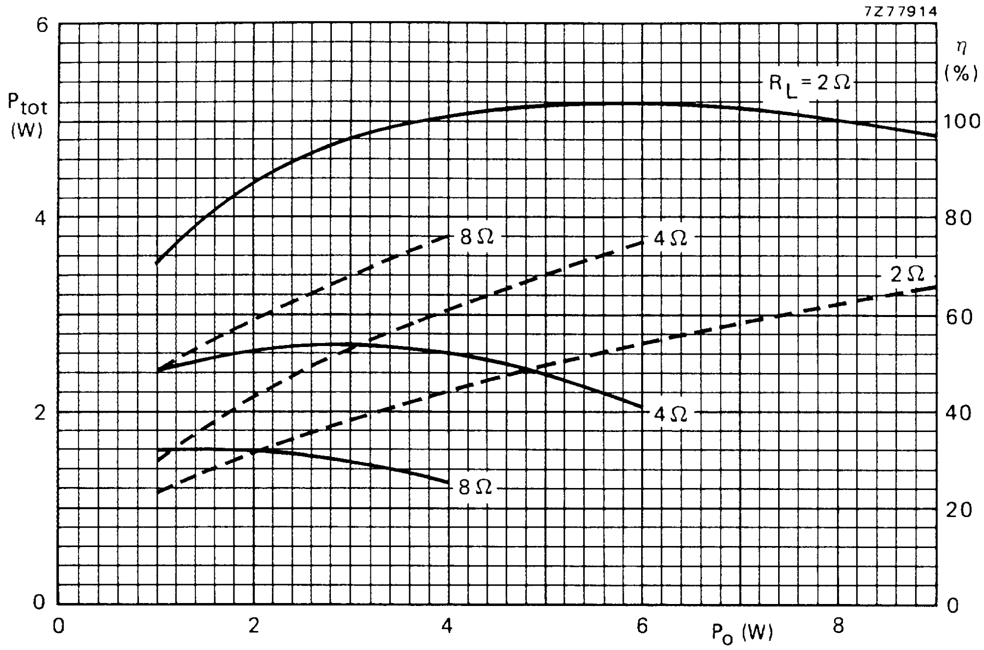


Fig.7 Total power dissipation (solid lines) and the efficiency (dashed lines) of the circuit of Fig.3 as a function of the output power with the load impedance as a parameter (for R_L = 2 Ω an external bootstrap resistor of 220 Ω has been used); typical values. V_P = 14,4 V; f = 1 kHz.

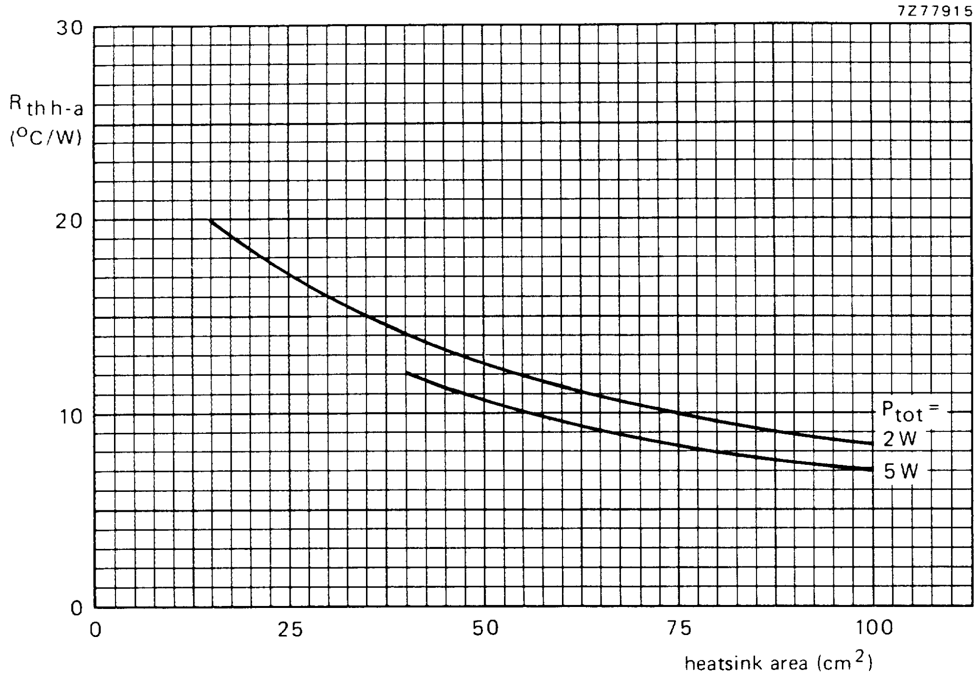


Fig.8 Thermal resistance from heatsink to ambient of a 1,5 mm thick bright aluminium heatsink as a function of the single-sided area of the heatsink with the total power dissipation as a parameter.

APPLICATION INFORMATION

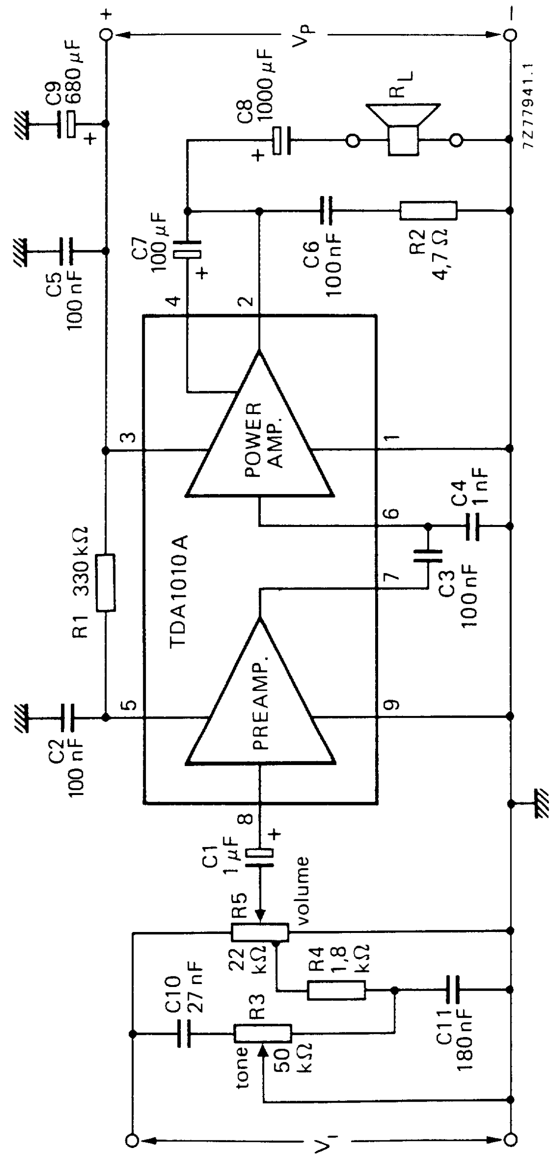


Fig.9 Complete mono audio amplifier of a car radio.

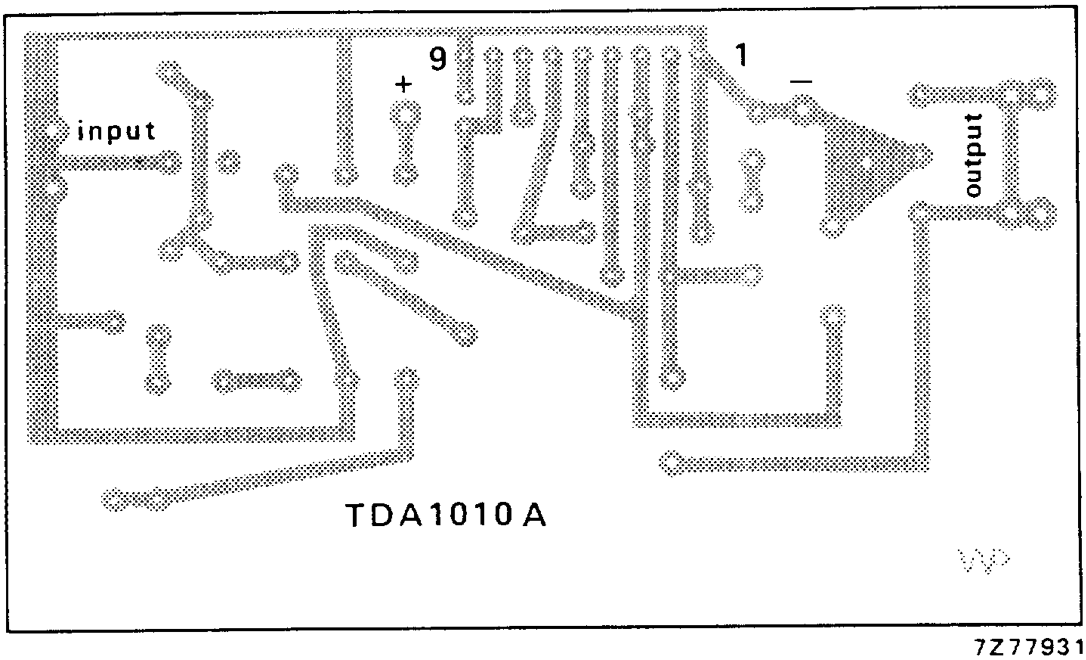


Fig.10 Track side of printed-circuit board used for the circuit of Fig.9; p.c. board dimensions 92 mm × 52 mm.

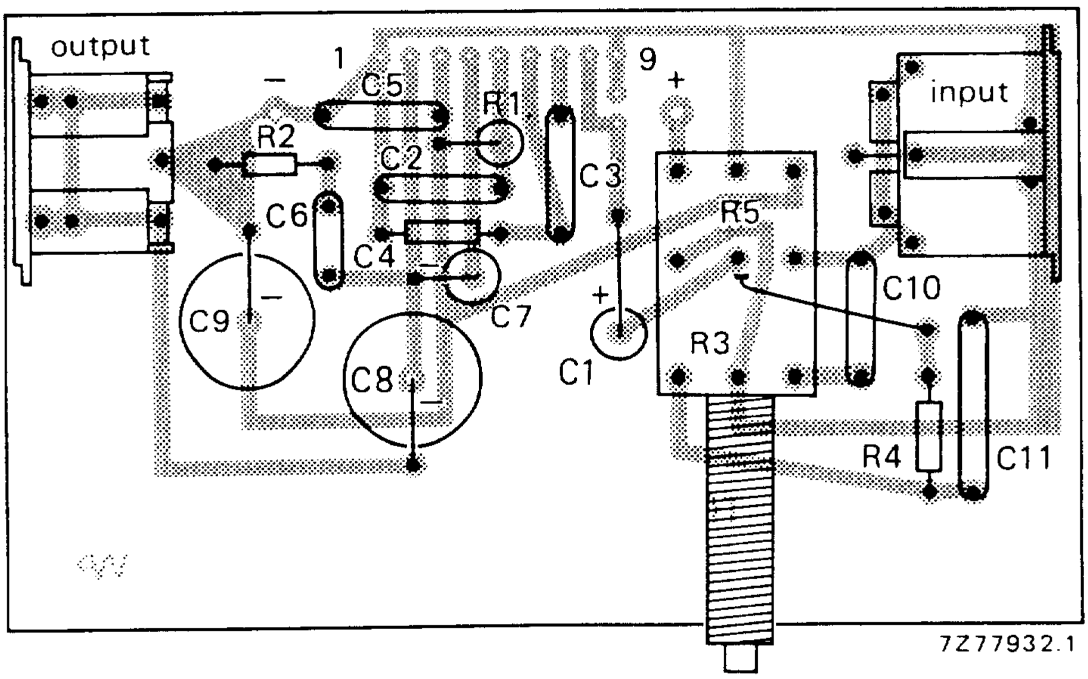


Fig.11 Component side of printed-circuit board showing component layout used for the circuit of Fig.9.

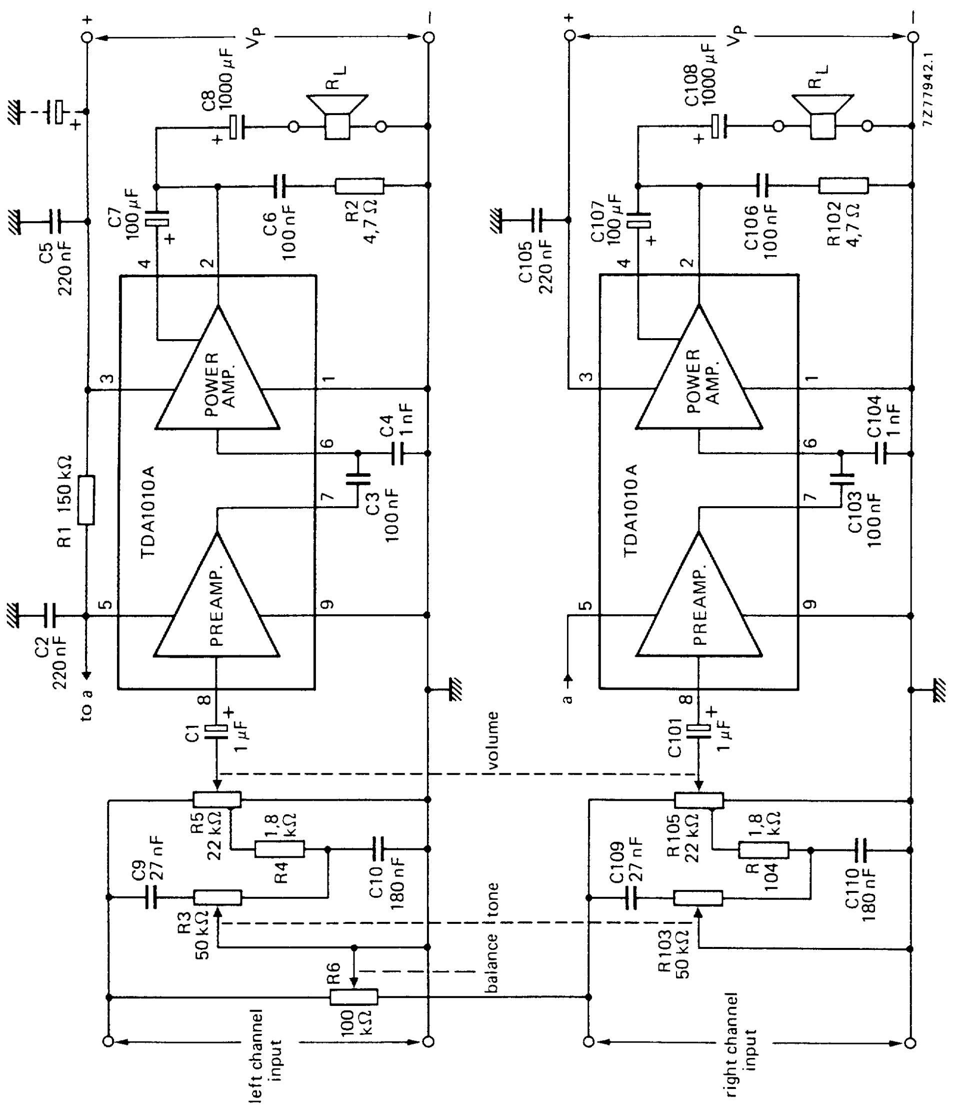


Fig.12 Complete stereo car radio amplifier.

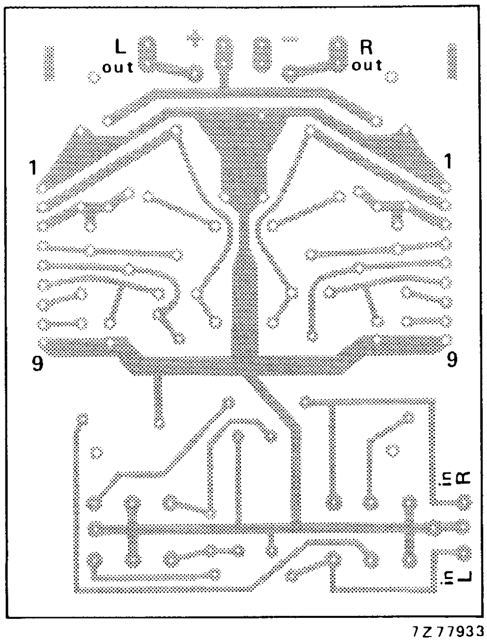


Fig.13 Track side of printed-circuit board used for the circuit of Fig.12; p.c. board dimensions 83 mm × 65 mm.

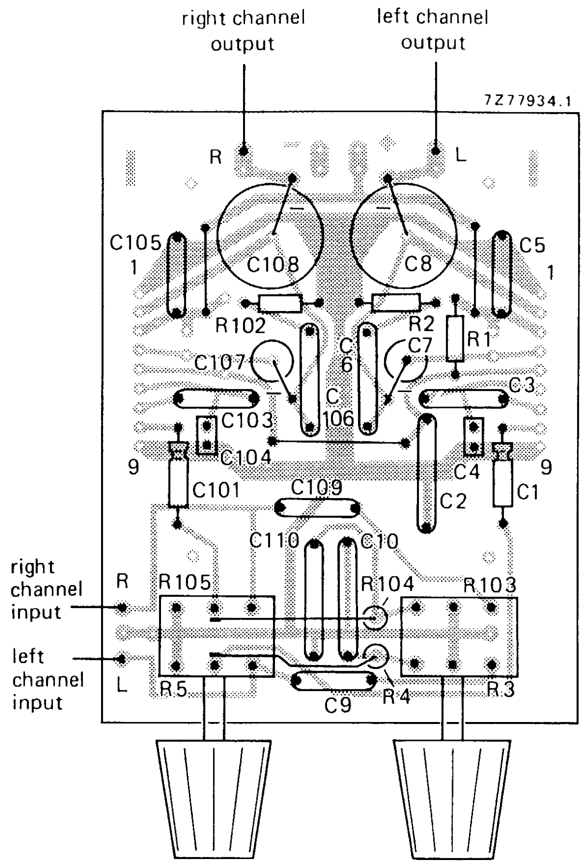


Fig.14 Component side of printed-circuit board showing component layout used for the circuit of Fig.12. Balance control is not on the p.c. board.

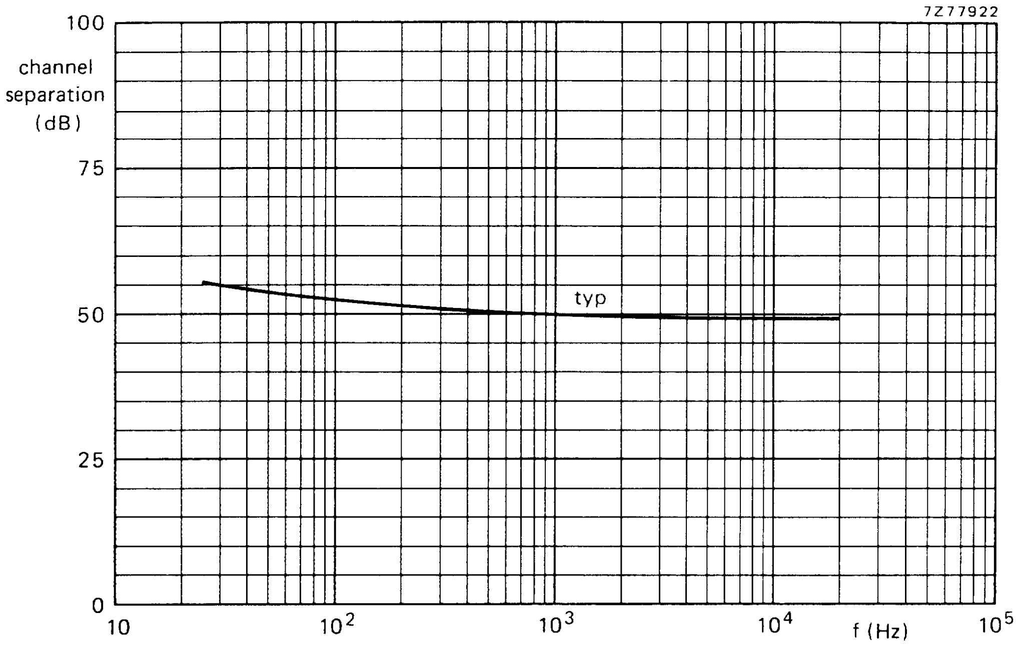


Fig.15 Channel separation of the circuit of Fig.12 as a function of the frequency.

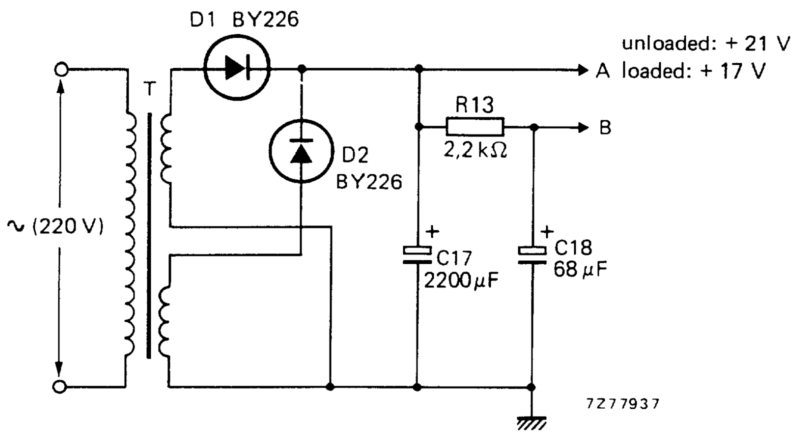


Fig.16 Power supply of circuit of Fig.17.

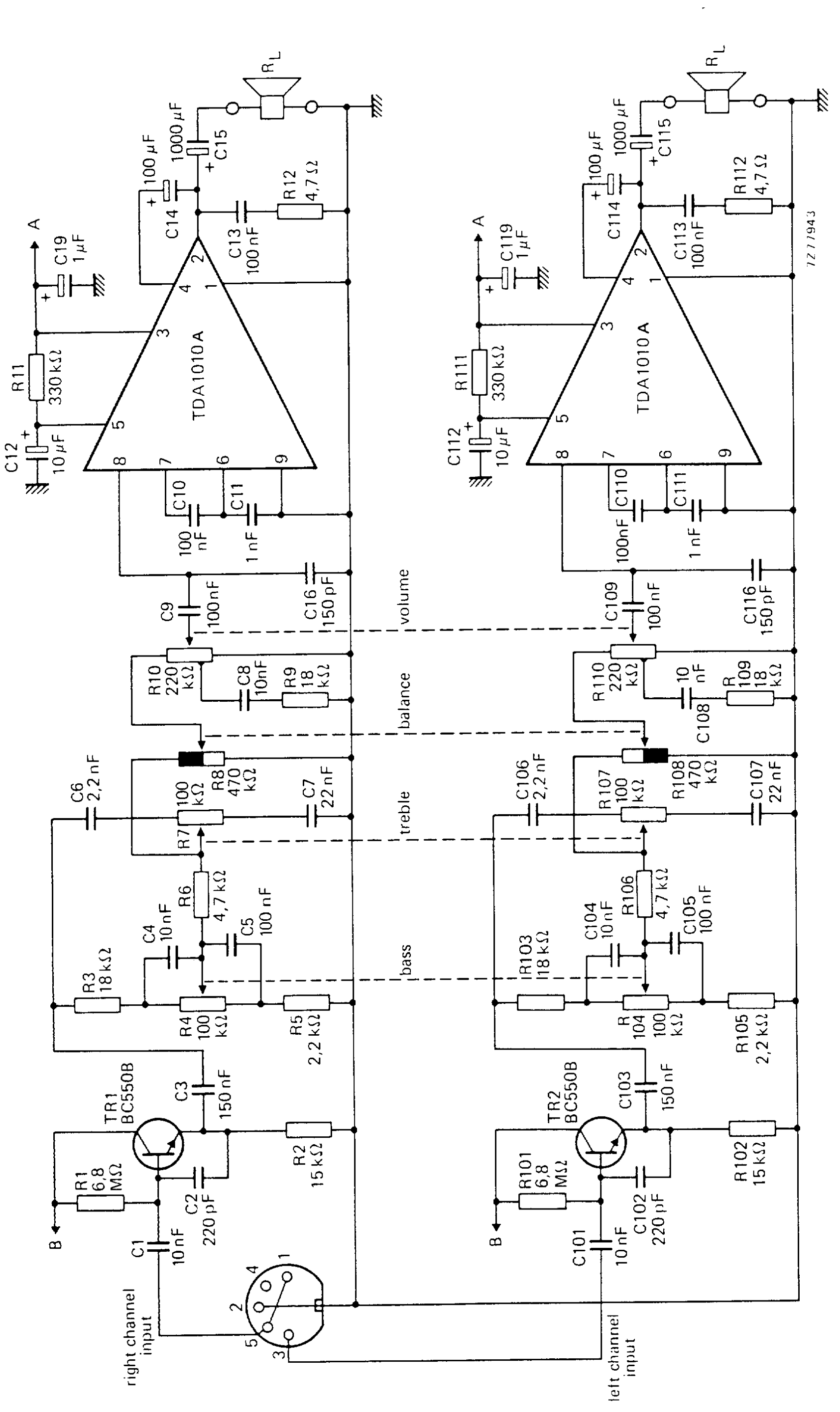


Fig.17 Complete mains-fed ceramic stereo pick-up amplifier; for power supply see Fig.16.

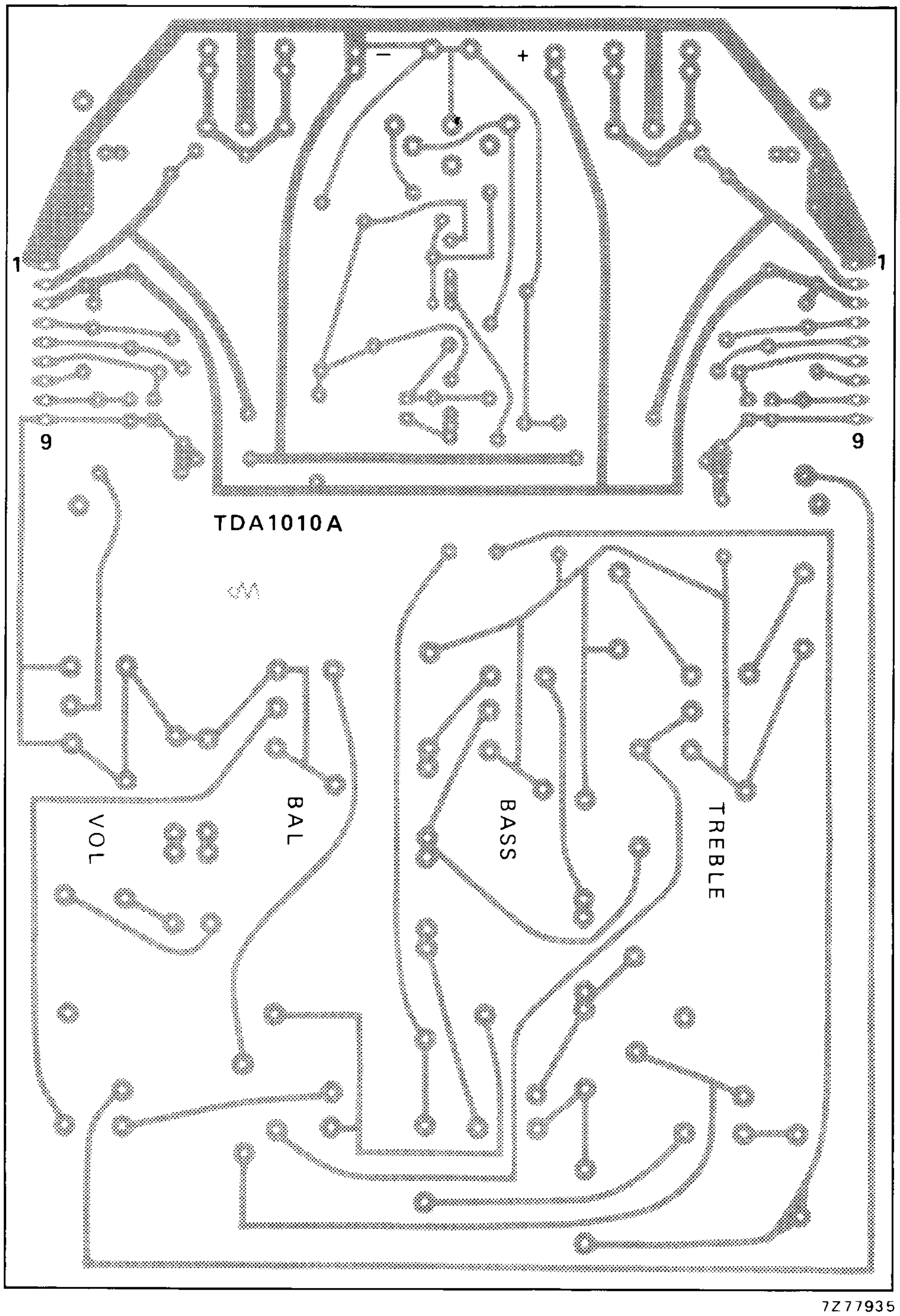


Fig.18 Track side of printed-circuit board used for the circuit of Fig.17 (Fig.16 partly); p.c. board dimensions 169 mm × 118 mm.

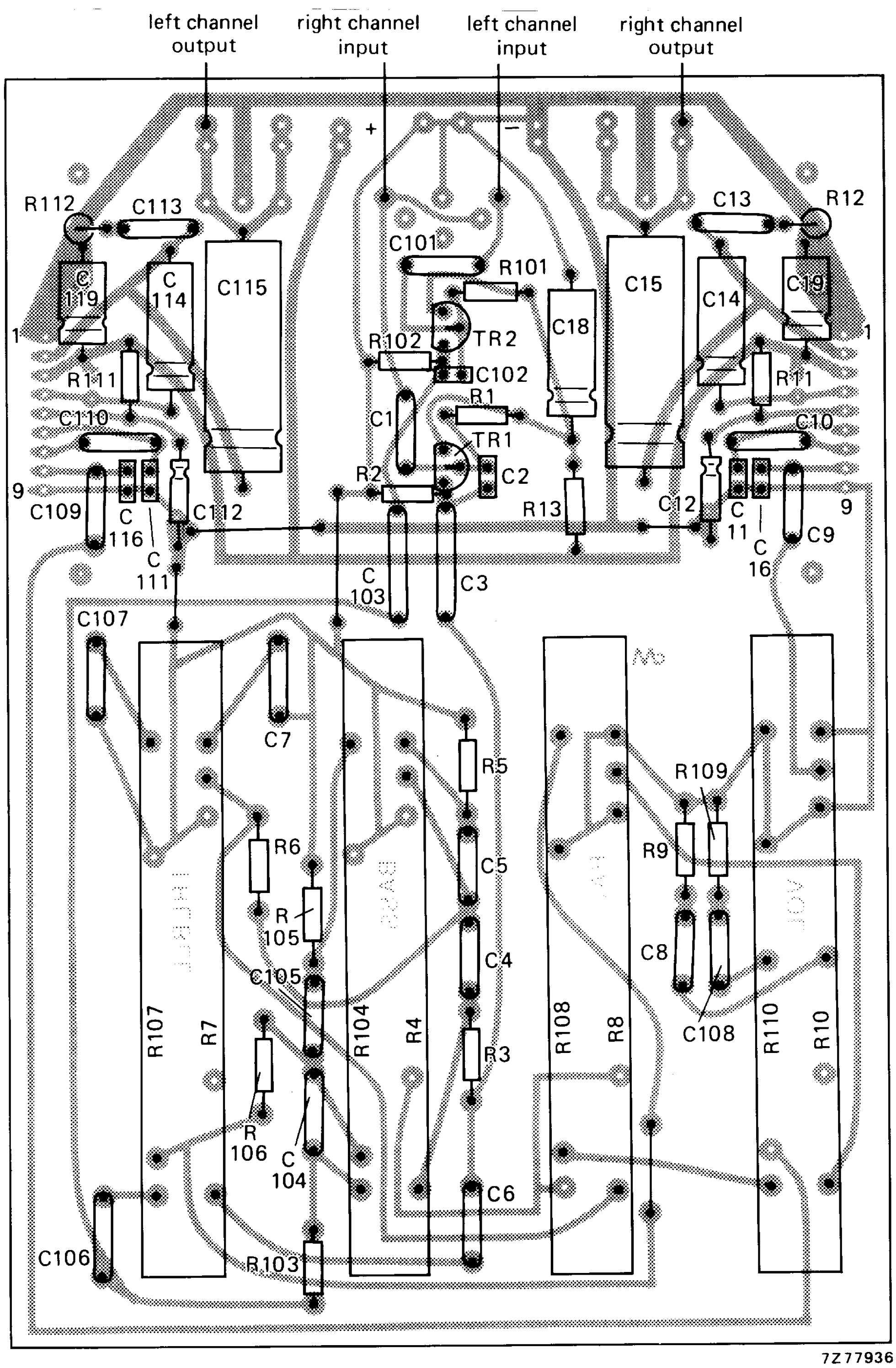
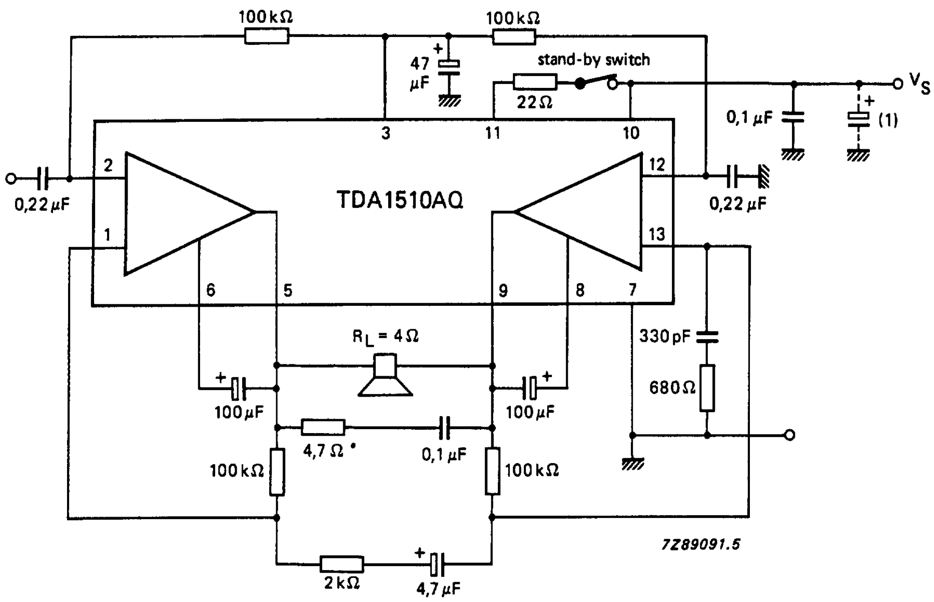


Fig.19 Component side of printed-circuit board showing component layout used for the circuit of Fig.17 (Fig.16 partly).

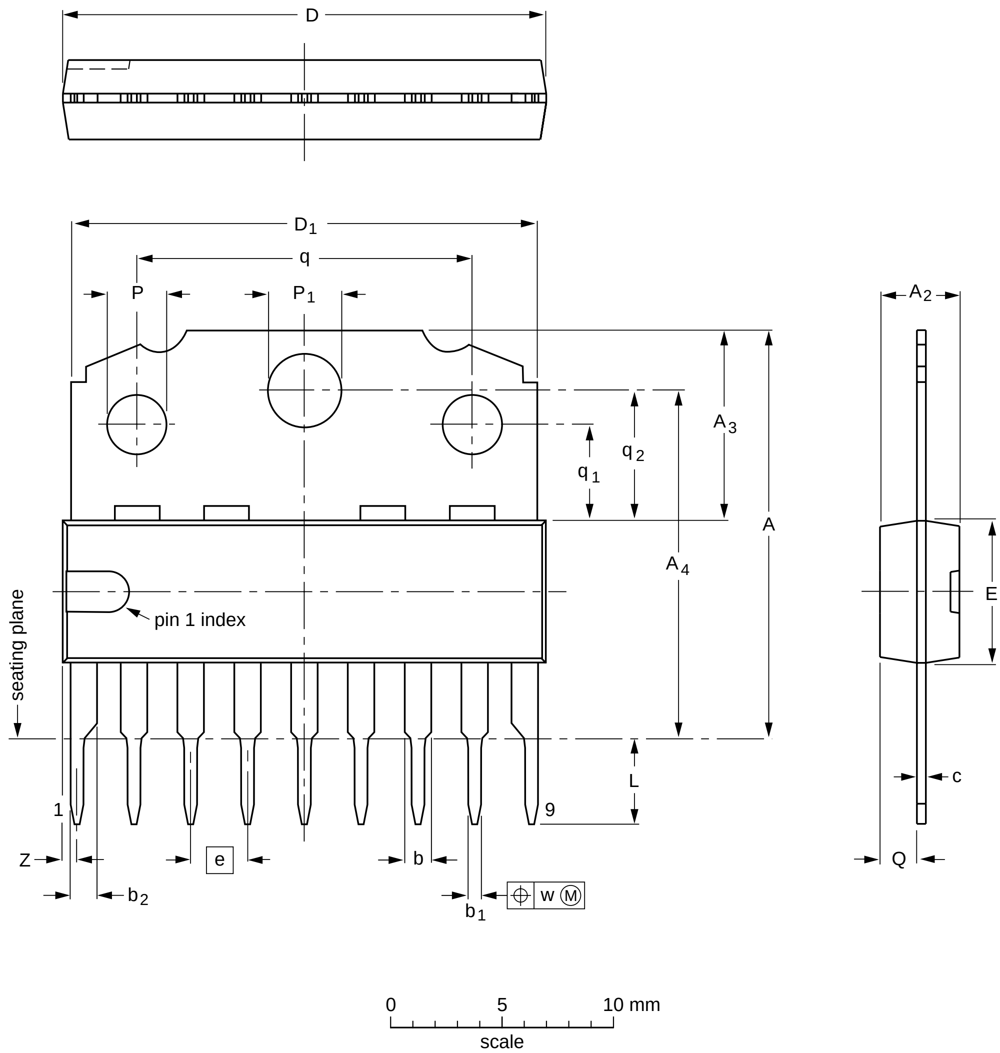


(1) belongs to power supply

Fig.20 Channel separation of the circuit of Fig.18 as a function of frequency.

PACKAGE OUTLINE

SIL9MPF: plastic single in-line medium power package with fin; 9 leads **SOT110-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_2 max.	A_3	A_4	b	b_1	b_2	c	$D^{(1)}$	D_1	$E^{(1)}$	e	L	P	P_1	Q	q	q_1	q_2	w	$Z^{(1)}$ max.
mm	18.5 17.8	3.7	8.7 8.0	15.8 15.4	1.40 1.14	0.67 0.50	1.40 1.14	0.48 0.38	21.8 21.4	21.4 20.7	6.48 6.20	2.54	3.9 3.4	2.75 2.50	3.4 3.2	1.75 1.55	15.1 14.9	4.4 4.2	5.9 5.7	0.25	1.0

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT110-1						~~92-11-17~~ 95-02-25

SOLDERING

Introduction

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our *"IC Package Databook"* (order code 9398 652 90011).

Soldering by dipping or by wave

The maximum permissible temperature of the solder is 260 °C; solder at this temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.

The device may be mounted up to the seating plane, but the temperature of the plastic body must not exceed the specified maximum storage temperature ($T_{stg\ max}$). If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the permissible limit.

Repairing soldered joints

Apply a low voltage soldering iron (less than 24 V) to the lead(s) of the package, below the seating plane or not more than 2 mm above it. If the temperature of the soldering iron bit is less than 300 °C it may remain in contact for up to 10 seconds. If the bit temperature is between 300 and 400 °C, contact may be up to 5 seconds.

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

LM386 Low Voltage Audio Power Amplifier

1 Features

- Battery Operation
- Minimum External Parts
- Wide Supply Voltage Range: 4 V–12 V or 5 V–18 V
- Low Quiescent Current Drain: 4 mA
- Voltage Gains from 20 to 200
- Ground-Referenced Input
- Self-Centering Output Quiescent Voltage
- Low Distortion: 0.2% (A_V = 20, V_S = 6 V, R_L = 8 Ω, P_O = 125 mW, f = 1 kHz)
- Available in 8-Pin MSOP Package

2 Applications

- AM-FM Radio Amplifiers
- Portable Tape Player Amplifiers
- Intercoms
- TV Sound Systems
- Line Drivers
- Ultrasonic Drivers
- Small Servo Drivers
- Power Converters

3 Description

The LM386M-1 and LM386MX-1 are power amplifiers designed for use in low voltage consumer applications. The gain is internally set to 20 to keep external part count low, but the addition of an external resistor and capacitor between pins 1 and 8 will increase the gain to any value from 20 to 200.

The inputs are ground referenced while the output automatically biases to one-half the supply voltage. The quiescent power drain is only 24 mW when operating from a 6-V supply, making the LM386M-1 and LM386MX-1 ideal for battery operation.

Device Information(1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
LM386N-1	PDIP (8)	9.60 mm × 6.35 mm
LM386N-3	PDIP (8)	9.60 mm × 6.35 mm
LM386N-4	PDIP (8)	9.60 mm × 6.35 mm
LM386M-1	SOIC (8)	4.90 mm × 3.90 mm
LM386MX-1	SOIC (8)	4.90 mm × 3.90 mm
LM386MMX-1	VSSOP (8)	3.00 mm × 3.00 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.

Schematic

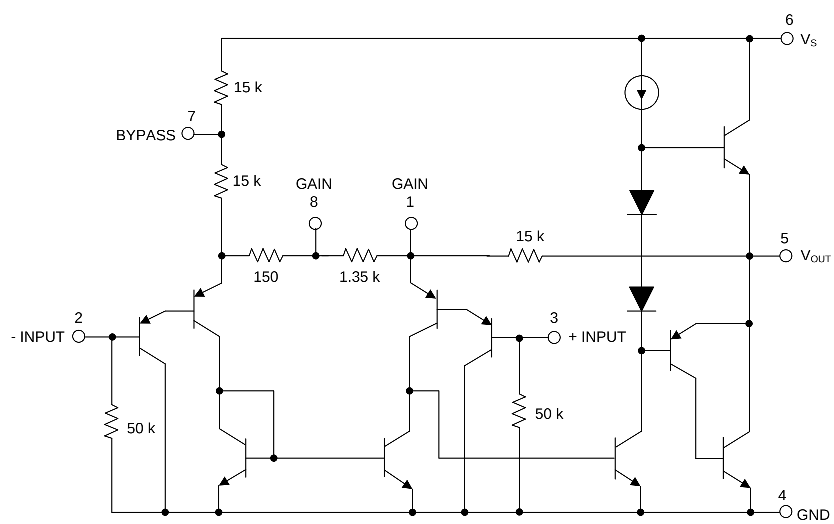


Table of Contents

4 Revision History

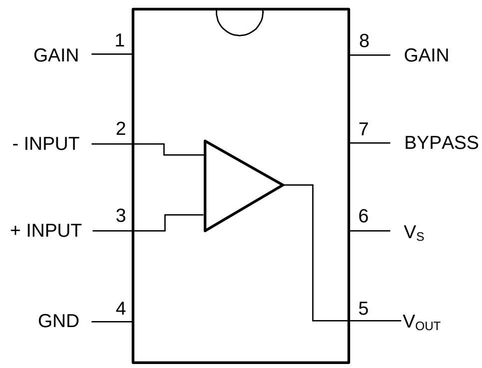
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision B (March 2017) to Revision C	Page
• Changed devices LM386M-1/LM386MX-1 To: LM386 in the data sheet title	1
• Changed From: LM386N-4 To: Speaker Impedance in the *Recommended Operating Conditions* table	4
• Changed From: 5 Ω to 12 Ω To: 5 V to 12 V for Supply Voltage in Table 1	8
• Changed kW To: kΩ in the *Gain Control* section	8
• Changed kW To: kΩ in the *Input Biasing* section	9
• Changed Figure 11	9
• Changed From: 5 Ω to 12 Ω To: 5 V to 12 V for Supply Voltage in Table 2	10
• Changed Figure 13	10
• Changed From: 5 Ω to 12 Ω To: 5 V to 12 V for Supply Voltage in Table 3	11
• Changed Figure 15	11
• Changed From: 5 Ω to 12 Ω To: 5 V to 12 V for Supply Voltage in Table 4	12
• Changed Figure 17	12
• Changed From: 5 Ω to 12 Ω To: 5 V to 12 V for Supply Voltage in Table 5	13
• Changed From: 5 Ω to 12 Ω To: 5 V to 12 V for Supply Voltage in Table 6	14
• Changed Figure 21	14
• Changed From: 5 Ω to 12 Ω To: 5 V to 12 V for Supply Voltage in Table 7	15
• Changed Figure 23	15

Changes from Revision A (May 2004) to Revision B	Page
• Added LM386MX-1 device to the data sheet.	1
• Added Device Information, Application and Implementation, Power Supply Recommendation, Layout, and Device and Documentation Support sections	1
• Inserted Functional Block Diagram	7

5 Pin Configuration and Functions

D Package
8-Pin MSOP
Top View



Pin Functions

PIN		TYPE	DESCRIPTION
NAME	NO.		
GAIN	1	–	Gain setting pin
–INPUT	2	I	Inverting input
+INPUT	3	I	Noninverting input
GND	4	P	Ground reference
V_{OUT}	5	O	Output
V_S	6	P	Power supply voltage
BYPASS	7	O	Bypass decoupling path
GAIN	8	–	Gain setting pin

6 Specifications

6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)(1)

		MIN	MAX	UNIT
Supply Voltage, V_{CC}	LM386N-1/-3, LM386M-1		15	V
	LM386N-4		22	
Package Dissipation	LM386N		1.25	W
	LM386M		0.73	
	LM386MM-1		0.595	
Input Voltage, V_I		–0.4	0.4	V
Storage temperature, T_{stg}		–65	150	°C

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

6.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001(1)	±1000	V
		Charged-device model (CDM), per JEDEC specification JESD22-C101(2)	±1000	

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

6.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

		MIN	NOM	MAX	UNIT
V_{CC}	Supply Voltage	4		12	V
	LM386N-4	5		18	V
	Speaker Impedance	4			Ω
VI	Analog input voltage	–0.4		0.4	V
TA	Operating free-air temperature	0		70	°C

6.4 Thermal Information

THERMAL METRIC(1)		LM386 D (SOIC) 8	LM386 DGK (VSSOP) 8	LM386 P (PDIP) 8	UNIT
$R_{\theta JA}$	Junction-to-ambient thermal resistance	115.7	169.3	53.4	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	59.7	73.1	42.1	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	56.2	100.2	30.6	°C/W
ψ_{JT}	Junction-to-top characterization parameter	12.4	9.2	19.0	°C/W
ψ_{JB}	Junction-to-board characterization parameter	55.6	99.1	50.5	°C/W

(1) For more information about traditional and new thermal metrics, see the *Semiconductor and IC Package Thermal Metrics* application report.

6.5 Electrical Characteristics

over operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
V_S	Operating Supply Voltage	LM386N-1, -3, LM386M-1, LM386MM-1	4		12	V
		LM386N-4	5		18	V
I_Q	Quiescent Current	V_S = 6 V, V_{IN} = 0		4	8	mA
P_{OUT}	Output Power	V_S = 6 V, R_L = 8 Ω, THD = 10% (LM386N-1, LM386M-1, LM386MM-1)	250	325		mW
		V_S = 9 V, R_L = 8 Ω, THD = 10% (LM386N-3)	500	700		mW
		V_S = 16 V, R_L = 32 Ω, THD = 10% (LM386N-4)	700	100		mW
A_V	Voltage Gain	V_S = 6 V, f = 1 kHz		26		dB
		10 µF from Pin 1 to 8		46		dB
BW	Bandwidth	V_S = 6 V, Pins 1 and 8 Open		300		kHz
THD	Total Harmonic Distortion	V_S = 6 V, R_L = 8 Ω, POUT = 125 mW f = 1 kHz, Pins 1 and 8 Open		0.2%		
PSRR	Power Supply Rejection Ratio	V_S = 6 V, f = 1 kHz, CBYPASS = 10 µF Pins 1 and 8 Open, Referred to Output		50		dB
R_{IN}	Input Resistance			50		kΩ
I_{BIAS}	Input Bias Current	V_S = 6 V, Pins 2 and 3 Open		250		nA

6.6 Typical Characteristics

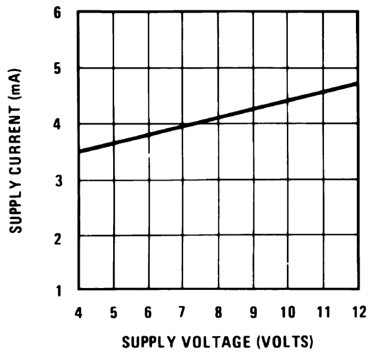


Figure 1. Supply Current vs Supply Voltage

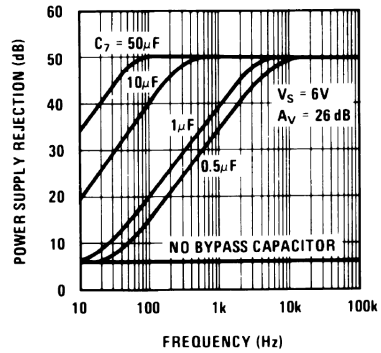


Figure 2. Power Supply Rejection vs Frequency

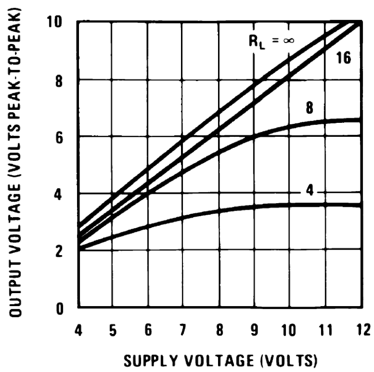


Figure 3. Output Voltage vs Supply Voltage

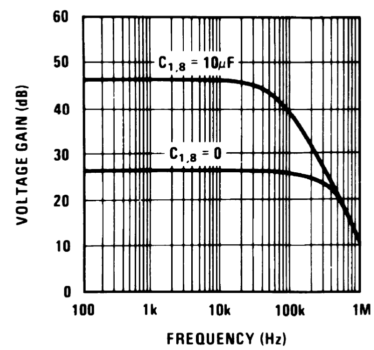


Figure 4. Voltage Gain vs Frequency

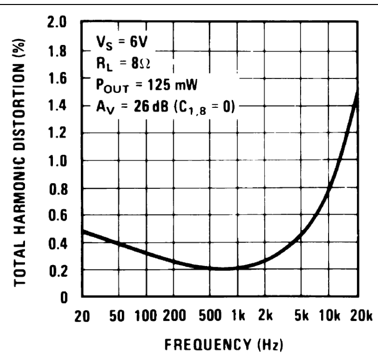


Figure 5. Total Harmonic Distortion vs Frequency

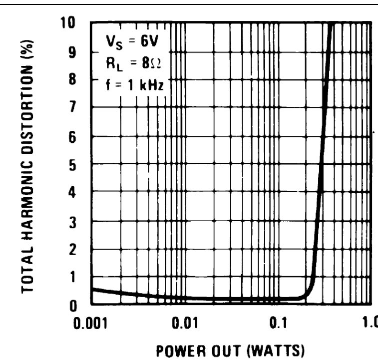


Figure 6. Total Harmonic Distortion vs Power Out

Typical Characteristics (continued)

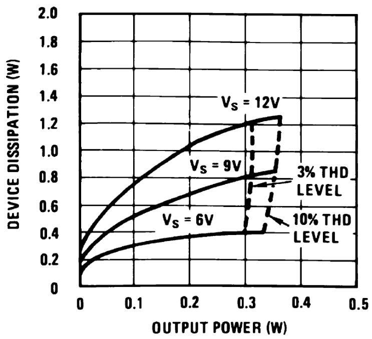


Figure 7. Device Dissipation vs Output Power

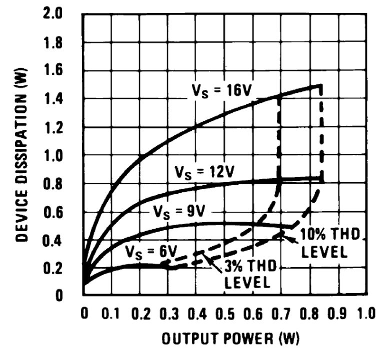


Figure 8. Device Dissipation vs Output Power

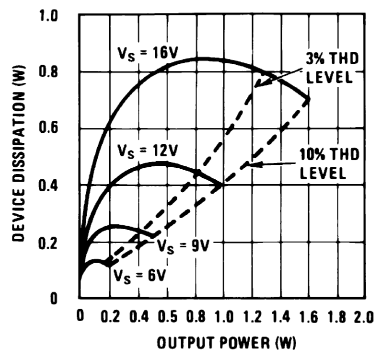


Figure 9. Device Dissipation vs Output Power

7 Parameter Measurement Information

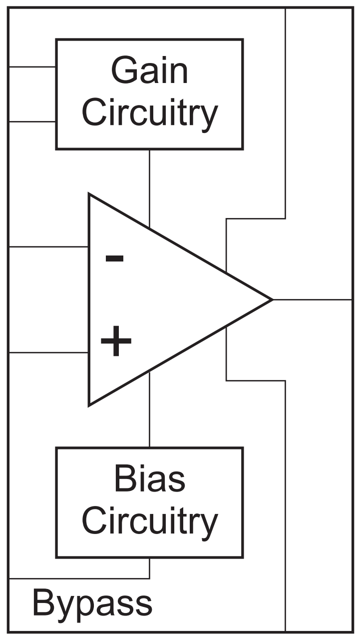
All parameters are measured according to the conditions described in the *Specifications* section.

8 Detailed Description

8.1 Overview

The LM386 is a mono low voltage amplifier that can be used in a variety of applications. It can drive loads from 4 Ω to 32 Ω. The gain is internally set to 20 but it can be modified from 20 to 200 by placing a resistor and capacitor between pins 1 and 8. This device comes in three different 8-pin packages as PDIP, SOIC and VSSOP to fit in different applications.

8.2 Functional Block Diagram



8.3 Feature Description

There is an internal 1.35-KΩ resistor that sets the gain of this device to 20. The gain can be modified from 20 to 200. Detailed information about gain setting can be found in the *Detailed Design Procedure* section.

8.4 Device Functional Modes

As this is an Op Amp it can be used in different configurations to fit in several applications. The internal gain setting resistor allows the LM386 to be used in a very low part count system. In addition a series resistor can be placed between pins 1 and 5 to modify the gain and frequency response for specific applications.

9 Application and Implementation

NOTE

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

9.1 Application Information

Below are shown different setups that show how the LM386 can be implemented in a variety of applications.

9.2 Typical Application

9.2.1 LM386 with Gain = 20

Figure 10 shows the minimum part count application that can be implemented using LM386. Its gain is internally set to 20.

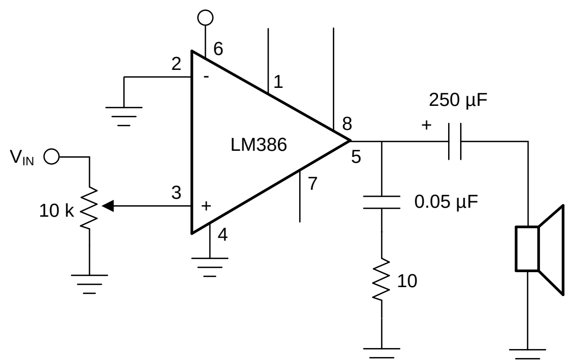


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Figure 10. LM386 with Gain = 20

9.2.1.1 Design Requirements

Table 1. Design Parameters

DESIGN PARAMETER	EXAMPLE VALUE
Load Impedance	4 Ω to 32 Ω
Supply Voltage	5 V to 12 V

9.2.1.2 Detailed Design Procedure

9.2.1.2.1 Gain Control

To make the LM386 a more versatile amplifier, two pins (1 and 8) are provided for gain control. With pins 1 and 8 open the 1.35-kΩ resistor sets the gain at 20 (26 dB). If a capacitor is put from pin 1 to 8, bypassing the 1.35-kΩ resistor, the gain will go up to 200 (46 dB). If a resistor is placed in series with the capacitor, the gain can be set to any value from 20 to 200. Gain control can also be done by capacitively coupling a resistor (or FET) from pin 1 to ground.

Additional external components can be placed in parallel with the internal feedback resistors to tailor the gain and frequency response for individual applications. For example, we can compensate poor speaker bass response by frequency shaping the feedback path. This is done with a series RC from pin 1 to 5 (paralleling the internal 15-kΩ resistor). For 6 dB effective bass boost: R ~= 15 kΩ, the lowest value for good stable operation is R = 10 kΩ if pin 8 is open. If pins 1 and 8 are bypassed then R as low as 2 kΩ can be used. This restriction is because the amplifier is only compensated for closed-loop gains greater than 9.

9.2.1.2.2 Input Biasing

The schematic shows that both inputs are biased to ground with a 50 kΩ resistor. The base current of the input transistors is about 250 nA, so the inputs are at about 12.5 mV when left open. If the dc source resistance driving the LM386 is higher than 250 kΩ it will contribute very little additional offset (about 2.5 mV at the input, 50 mV at the output). If the dc source resistance is less than 10 kΩ, then shorting the unused input to ground will keep the offset low (about 2.5 mV at the input, 50 mV at the output). For dc source resistances between these values we can eliminate excess offset by putting a resistor from the unused input to ground, equal in value to the dc source resistance. Of course all offset problems are eliminated if the input is capacitively coupled.

When using the LM386 with higher gains (bypassing the 1.35 kΩ resistor between pins 1 and 8) it is necessary to bypass the unused input, preventing degradation of gain and possible instabilities. This is done with a 0.1 μF capacitor or a short to ground depending on the dc source resistance on the driven input.

9.2.1.3 Application Curve

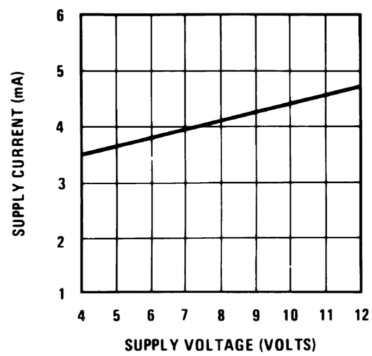

Figure 11. Supply Current vs Supply Voltage

9.2.2 LM386 with Gain = 200

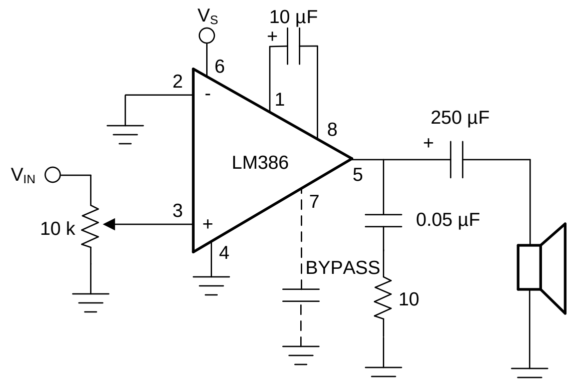

Figure 12. LM386 with Gain = 200

9.2.2.1 Design Requirements

Table 2. Design Parameters

DESIGN PARAMETER	EXAMPLE VALUE
Load Impedance	4 Ω to 32 Ω
Supply Voltage	5 V to 12 V

9.2.2.2 Detailed Design Procedure

The Detailed Design Procedure can be found in the *Detailed Design Procedure* section.

9.2.2.3 Application Curve

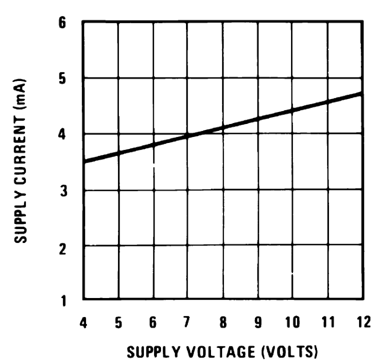

Figure 13. Supply Current vs Supply Voltage

9.2.3 LM386 with Gain = 50

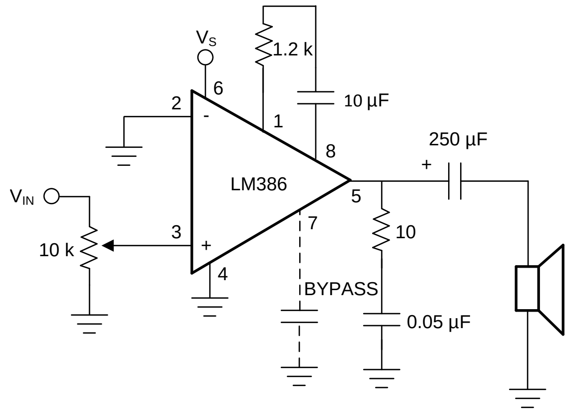

Figure 14. LM386 with Gain = 50

9.2.3.1 Design Requirements

Table 3. Design Parameters

DESIGN PARAMETER	EXAMPLE VALUE
Load Impedance	4 Ω to 32 Ω
Supply Voltage	5 V to 12 V

9.2.3.2 Detailed Design Procedure

The Detailed Design Procedure can be found in the *Detailed Design Procedure* section.

9.2.3.3 Application Curve

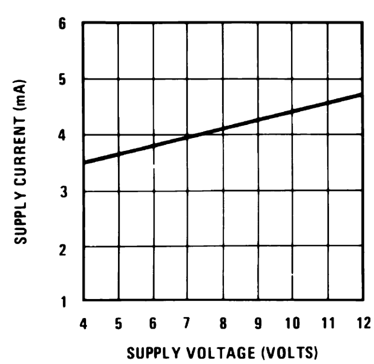

Figure 15. Supply Current vs Supply Voltage

9.2.4 Low Distortion Power Wienbridge Oscillator

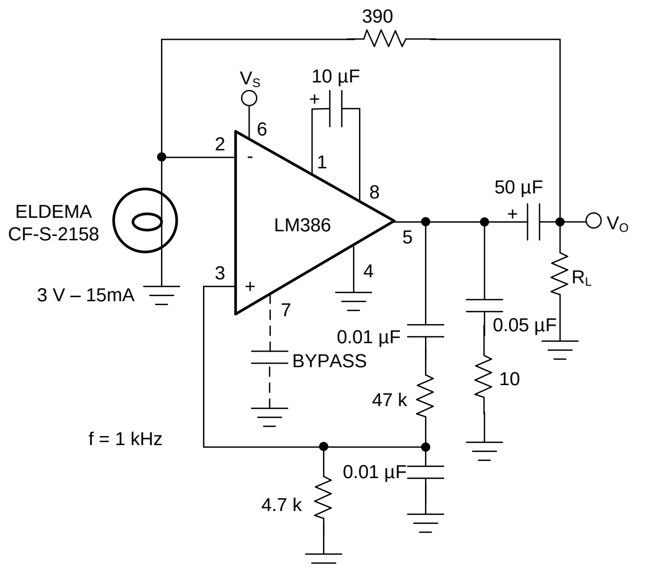

Figure 16. Low Distortion Power Wienbridge Oscillator

9.2.4.1 Design Requirements

Table 4. Design Parameters

DESIGN PARAMETER	EXAMPLE VALUE
Load Impedance	4 Ω to 32 Ω
Supply Voltage	5 V to 12 V

9.2.4.2 Detailed Design Procedure

The Detailed Design Procedure can be found in the *Detailed Design Procedure* section.

9.2.4.3 Application Curve

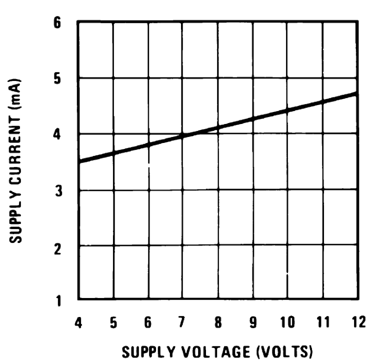

Figure 17. Supply Current vs Supply Voltage

9.2.5 LM386 with Bass Boost

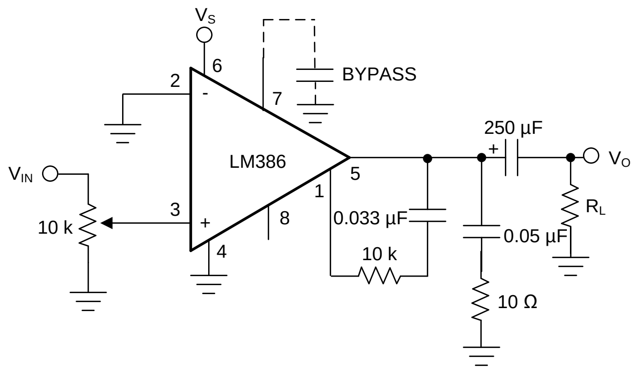

Figure 18. LM386 with Bass Boost

9.2.5.1 Design Requirements

Table 5. Design Parameters

DESIGN PARAMETER	EXAMPLE VALUE
Load Impedance	4 Ω to 32 Ω
Supply Voltage	5 V to 12 V

9.2.5.2 Detailed Design Procedure

The Detailed Design Procedure can be found in the *Detailed Design Procedure* section.

9.2.5.3 Application Curve

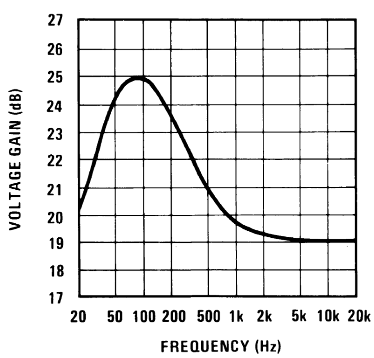

Figure 19. Voltage Gain vs Frequency

9.2.6 Square Wave Oscillator

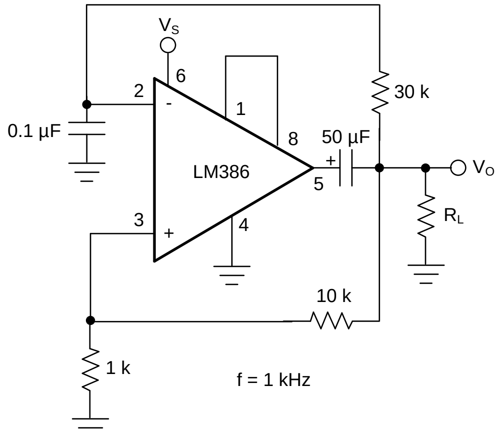

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Figure 20. Square Wave Oscillator

Table 6. Design Parameters

DESIGN PARAMETER	EXAMPLE VALUE
Load Impedance	4 Ω to 32 Ω
Supply Voltage	5 V to 12 V

9.2.6.1 Detailed Design Procedure

The Detailed Design Procedure can be found in the *Detailed Design Procedure* section.

9.2.6.2 Application Curve

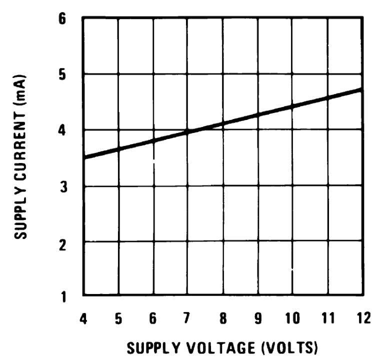

Figure 21. Supply Current vs Supply Voltage

9.2.7 AM Radio Power Amplifier

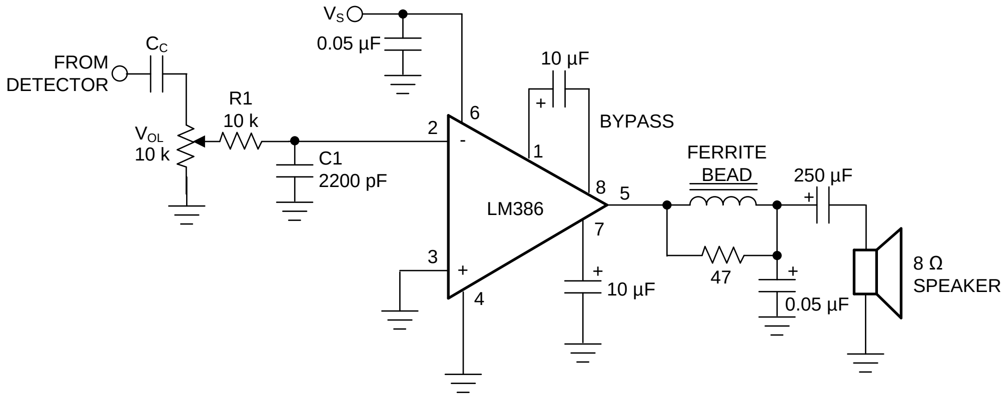

Figure 22. AM Radio Power Amplifier

9.2.7.1 Design Requirements

Table 7. Design Parameters

DESIGN PARAMETER	EXAMPLE VALUE
Load Impedance	4 Ω to 32 Ω
Supply Voltage	5 V to 12 V

9.2.7.2 Detailed Design Procedure

The Detailed Design Procedure can be found in the *Detailed Design Procedure* section.

9.2.7.3 Application Curve

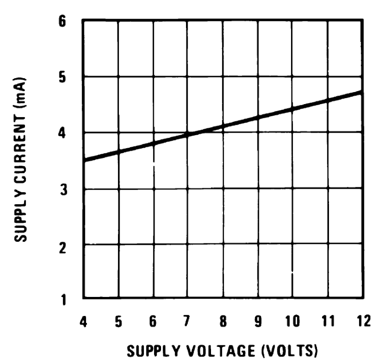

Figure 23. Supply Current vs Supply Voltage

10 Power Supply Recommendations

The LM386 is specified for operation up to 12 V or 18 V. The power supply should be well regulated and the voltage must be within the specified values. It is recommended to place a capacitor to GND close to the LM386 power supply pin.

11 Layout

11.1 Layout Guidelines

Place all required components as close as possible to the device. Use short traces for the output to the speaker connection. Route the analog traces far from the digital signal traces and avoid crossing them.

11.2 Layout Examples

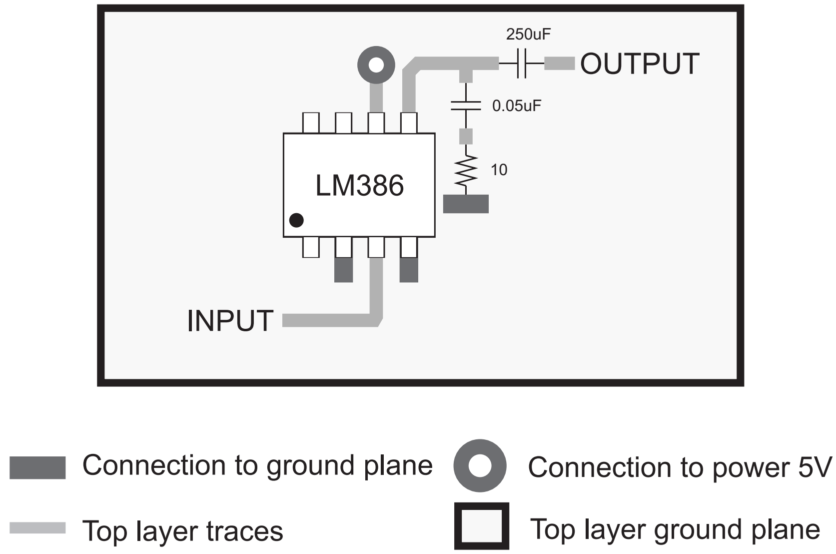

Figure 24. Layout Example for Minimum Parts Gain = 20 dB on PDIP package

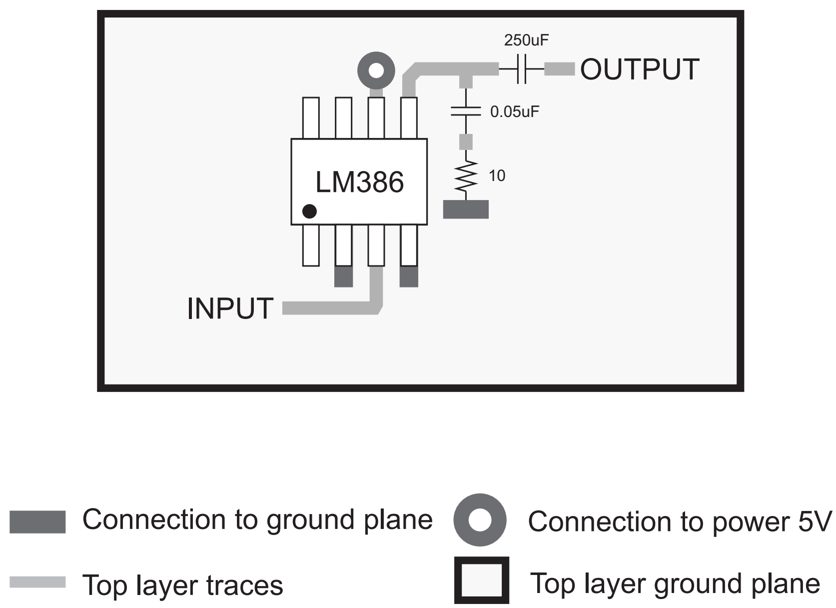

Figure 25. Layout Example for Minimum Parts Gain = 20 dB on SOIC package

Layout Examples (continued)

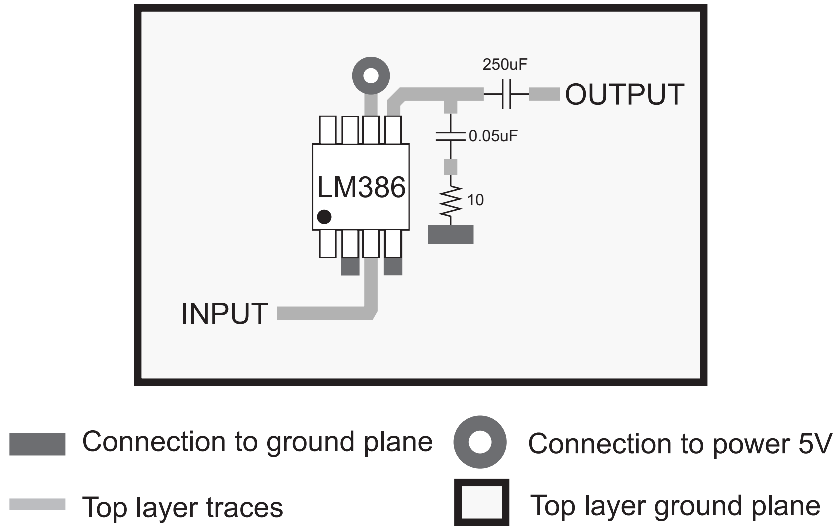

Figure 26. Layout Example for Minimum Parts Gain = 20 dB on VSSOP package

12 Device and Documentation Support

12.1 Device Support

12.1.1 Development Support

12.2 Documentation Support

12.3 Related Links

The table below lists quick access links. Categories include technical documents, support and community resources, tools and software, and quick access to order now.

Table 8. Related Links

PARTS	PRODUCT FOLDER	ORDER NOW	TECHNICAL DOCUMENTS	TOOLS & SOFTWARE	SUPPORT & COMMUNITY
LM386M-1	Click here	Click here	Click here	Click here	Click here
LM386MX-1	Click here	Click here	Click here	Click here	Click here

12.4 Receiving Notification of Documentation Updates

To receive notification of documentation updates — go to the product folder for your device on ti.com. In the upper right-hand corner, click the *Alert me* button to register and receive a weekly digest of product information that has changed (if any). For change details, check the revision history of any revised document.

12.5 Community Resources

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

TI E2E™ Online Community ***TI's Engineer-to-Engineer (E2E) Community.*** Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

Design Support ***TI's Design Support*** Quickly find helpful E2E forums along with design support tools and contact information for technical support.

12.6 Trademarks

E2E is a trademark of Texas Instruments.
All other trademarks are the property of their respective owners.

12.7 Electrostatic Discharge Caution

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

12.8 Glossary

SLYZ022 — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

13 Mechanical, Packaging, and Orderable Information

The following pages include mechanical, packaging, and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
LM386M-1/NOPB	ACTIVE	SOIC	D	8	95	RoHS & Green	SN	Level-1-260C-UNLIM	0 to 70	LM386 M-1	Samples
LM386MMX-1/NOPB	ACTIVE	VSSOP	DGK	8	3500	RoHS & Green	SN	Level-1-260C-UNLIM	0 to 70	Z86	Samples
LM386MX-1/NOPB	ACTIVE	SOIC	D	8	2500	RoHS & Green	SN	Level-1-260C-UNLIM	0 to 70	LM386 M-1	Samples
LM386N-1/NOPB	ACTIVE	PDIP	P	8	40	RoHS & Green	Call TI | SN	Level-1-NA-UNLIM	0 to 70	LM 386N-1	Samples
LM386N-3/NOPB	ACTIVE	PDIP	P	8	40	RoHS & Green	SN	Level-1-NA-UNLIM	0 to 70	LM 386N-3	Samples
LM386N-4/NOPB	ACTIVE	PDIP	P	8	40	RoHS & Green	Call TI | SN	Level-1-NA-UNLIM	0 to 70	LM 386N-4	Samples

(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
PREVIEW: Device has been announced but is not in production. Samples may or may not be available.
OBSOLETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

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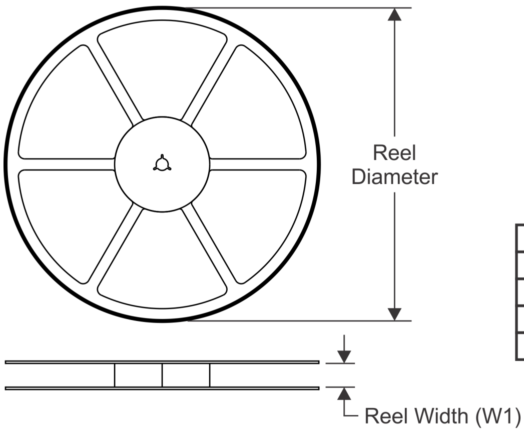
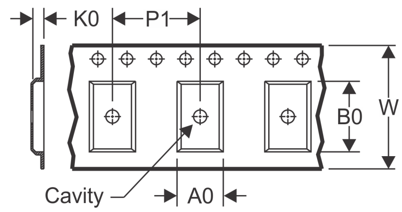
TAPE AND REEL INFORMATION

REEL DIMENSIONS

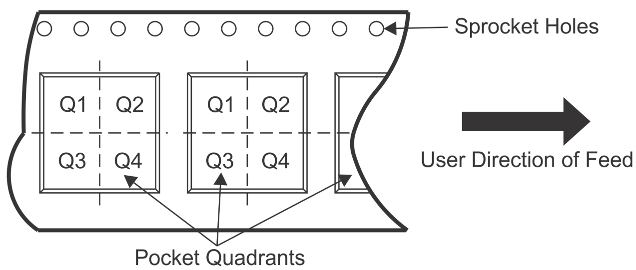


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

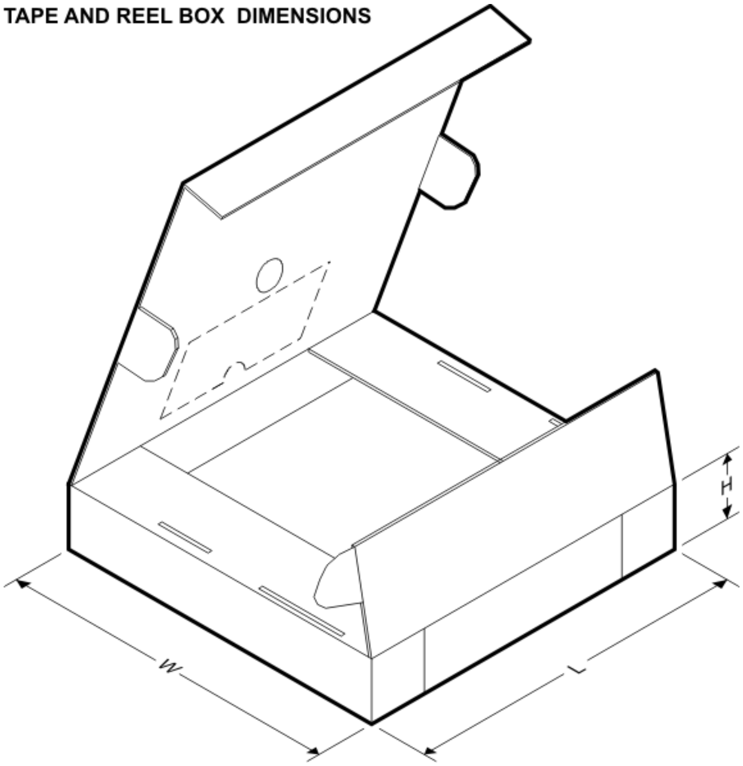
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

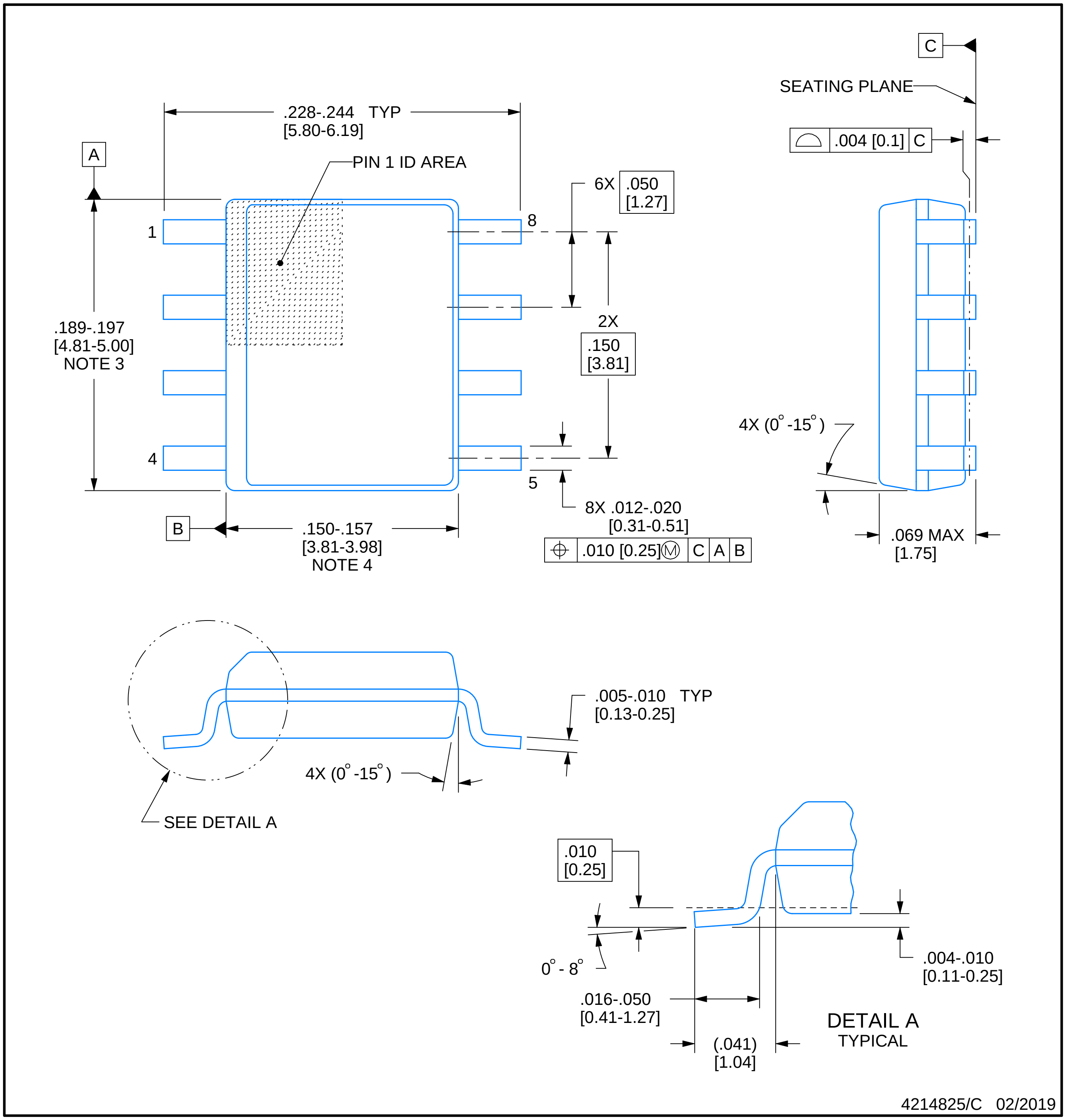
Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
LM386MMX-1/NOPB	VSSOP	DGK	8	3500	330.0	12.4	5.3	3.4	1.4	8.0	12.0	Q1
LM386MX-1/NOPB	SOIC	D	8	2500	330.0	12.4	6.5	5.4	2.0	8.0	12.0	Q1

TAPE AND REEL BOX DIMENSIONS



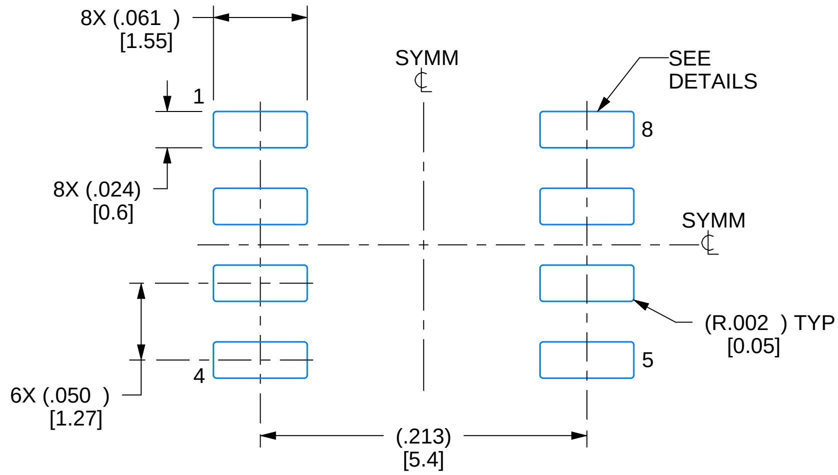
*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
LM386MMX-1/NOPB	VSSOP	DGK	8	3500	367.0	367.0	35.0
LM386MX-1/NOPB	SOIC	D	8	2500	367.0	367.0	35.0

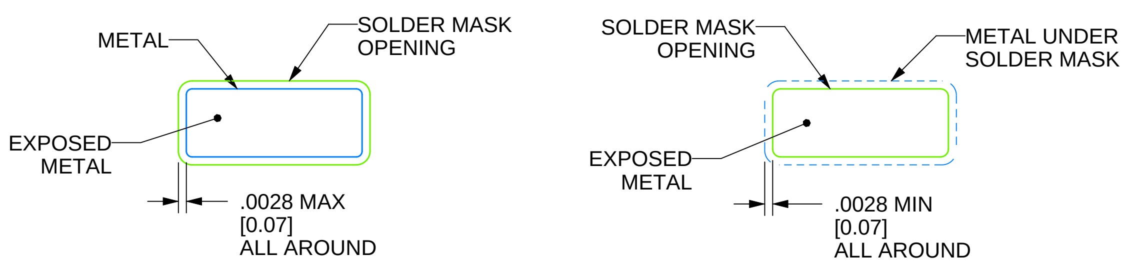


NOTES:

1. Linear dimensions are in inches [millimeters]. Dimensions in parenthesis are for reference only. Controlling dimensions are in inches. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 [0.15] per side.
4. This dimension does not include interlead flash.
5. Reference JEDEC registration MS-012, variation AA.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE:8X



NON SOLDER MASK
DEFINED

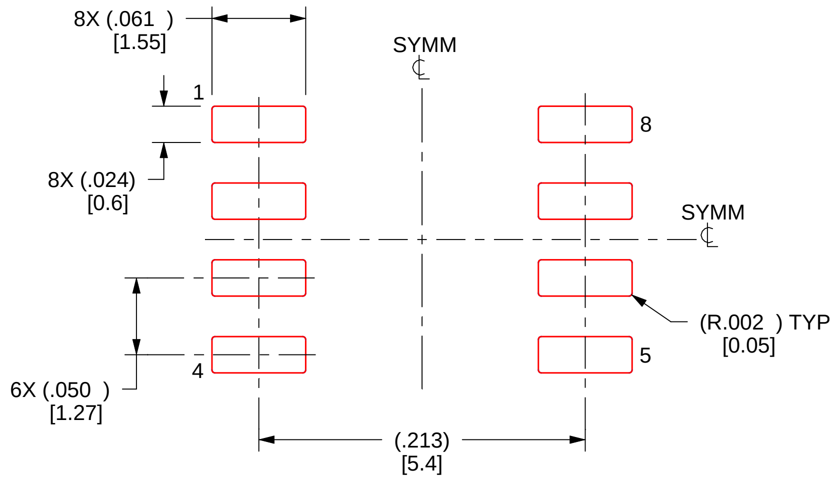
SOLDER MASK
DEFINED

SOLDER MASK DETAILS

4214825/C 02/2019

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



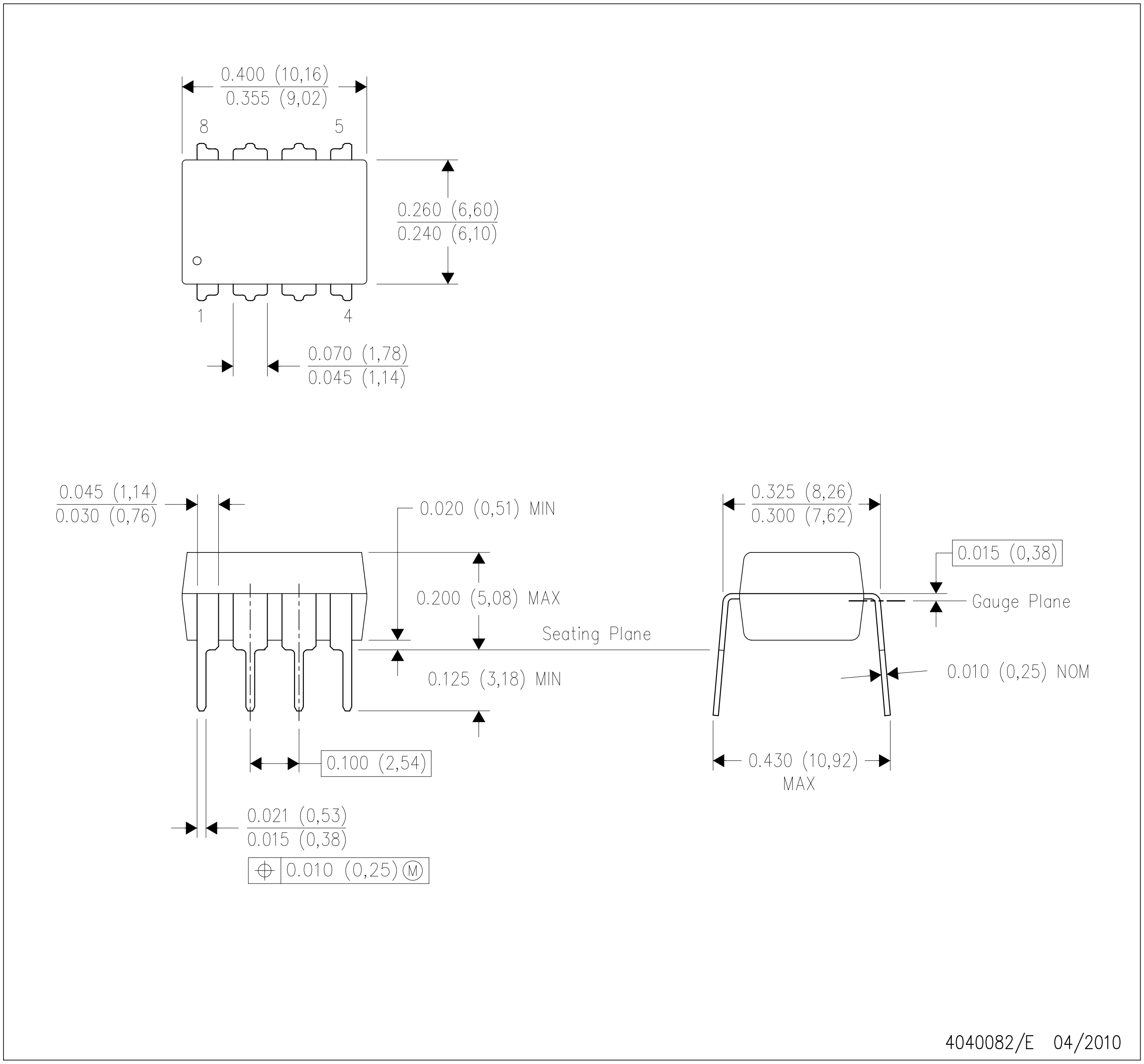
SOLDER PASTE EXAMPLE
BASED ON .005 INCH [0.125 MM] THICK STENCIL
SCALE:8X

4214825/C 02/2019

NOTES: (continued)

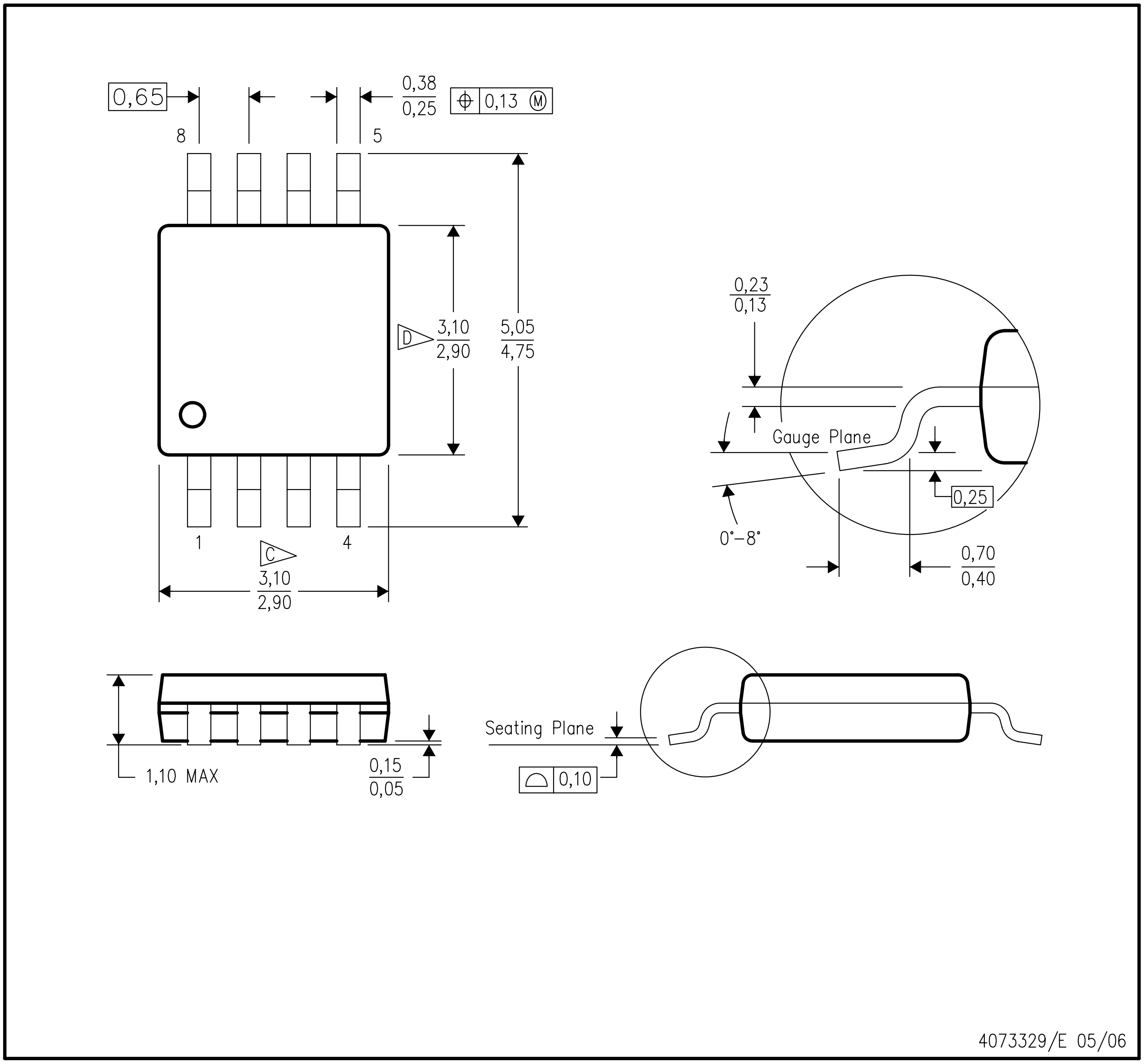
8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

P (R–PDIP–T8) PLASTIC DUAL–IN–LINE PACKAGE



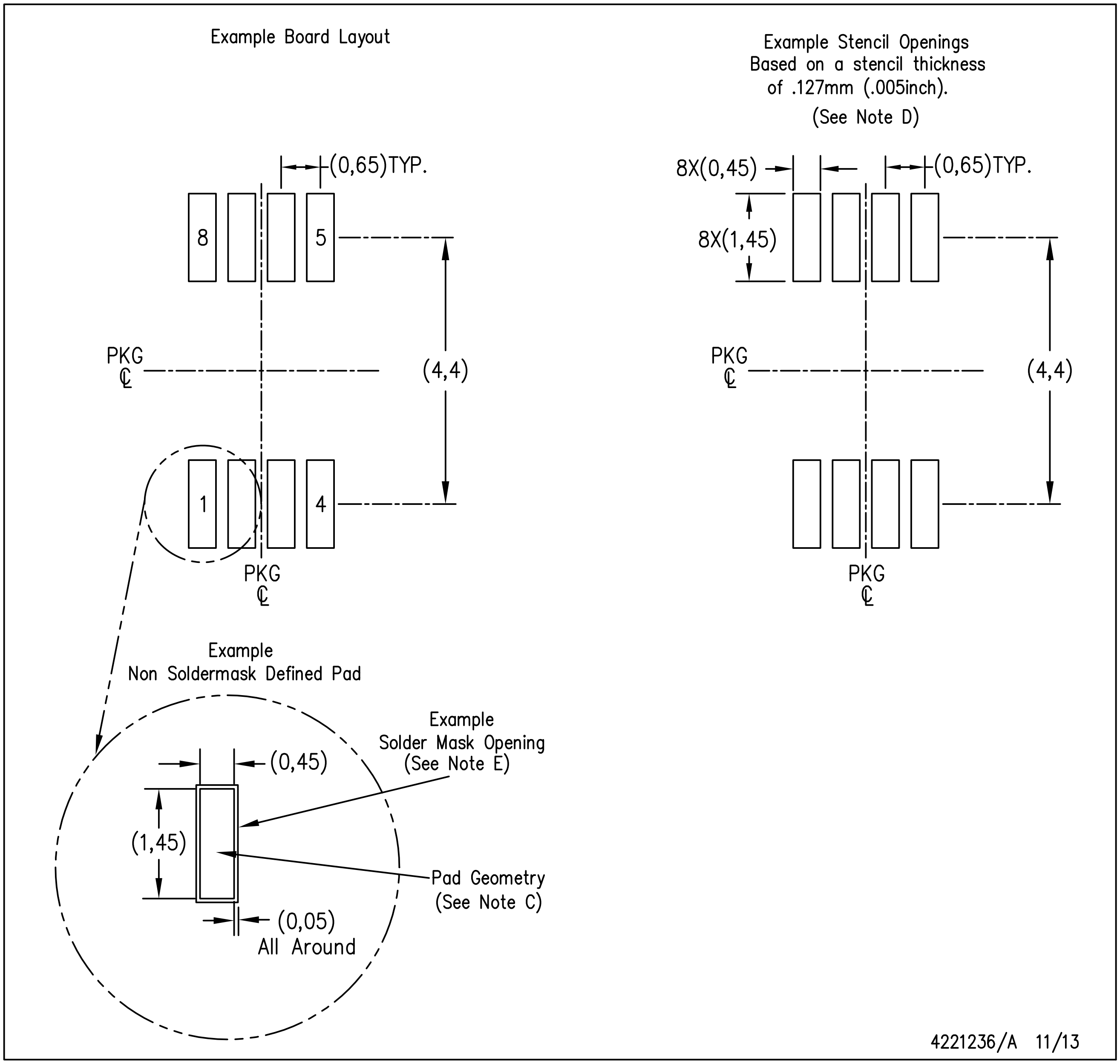
NOTES:
- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Falls within JEDEC MS–001 variation BA.

DGK (S-PDSO-G8) PLASTIC SMALL-OUTLINE PACKAGE



NOTES:
- A. All linear dimensions are in millimeters.
- B. This drawing is subject to change without notice.
- C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 per end.
- D. Body width does not include interlead flash. Interlead flash shall not exceed 0.50 per side.
- E. Falls within JEDEC MO-187 variation AA, except interlead flash.

DGK (S–PDSO–G8) PLASTIC SMALL OUTLINE PACKAGE



NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate designs.
D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC–7525 for other stencil recommendations.
E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

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