Sound, music and light modules

Order code	Manufacturer code	Description
13-0668	n/a	MOBILE PHONE FLASHER MODULE - 2 LEDS

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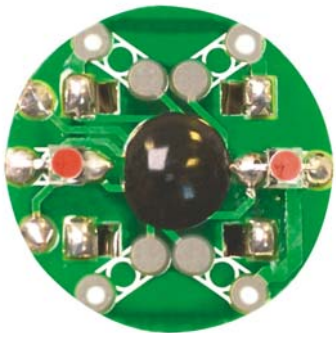
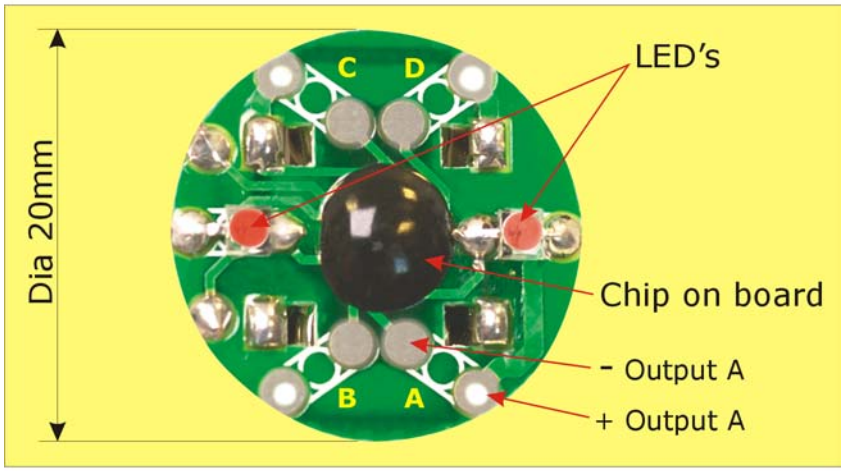
MOBILE PHONE MODULE

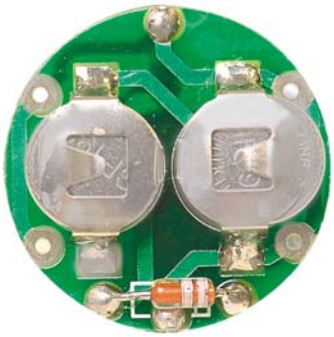
The mobile phone module is designed to flash a light pattern when a phone signal is detected. The module will react to either incoming or outgoing signals.

The module will detect frequencies from 900 to 1800Hz. When the module is triggered it will flash a light sequence for approximately 20 seconds. The module uses less than 1uA in standby mode, which means the batteries will last for a long time. When the module is operated the operating current is 5mA. After triggering the unit has a 10 second delay before the module can be triggered again.



Front view



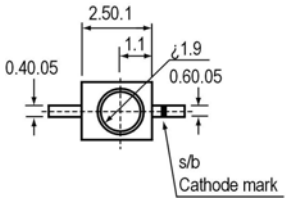


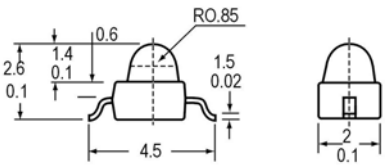
Battery view

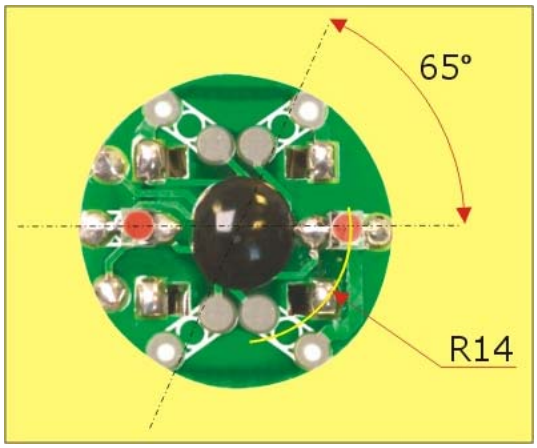
The module can be used as an input device to trigger other circuits. The module has four additional sets of contacts A-D as seen in the diagram above. Additional LEDs can be soldered to these contacts, or a pair of wires attached which can then be connected to an alternative circuit.

The following surface mount LED's are suitable as additional LEDs for mounting on the module:

Red	72-8350
Green	72-8360
Yellow	72-8365





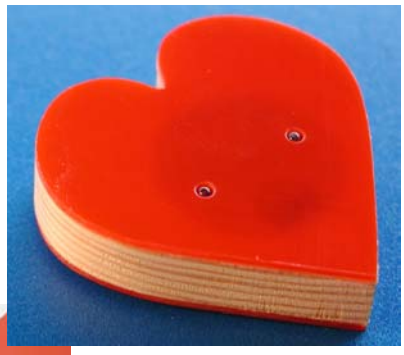


The diagram to the left shows the location for the centre of the LEDs.

The picture to the right demonstrates how wire can be attached so that the module can be used to trigger other circuits.

EXAMPLE PROJECT

The following examples help to demonstrate how the mobile phone module can be incorporated into student project work.



The photograph on the right shows a simple heart shape made form softwood.

- Firstly a 20mm diameter hole is bored through a section of softwood. The wood needs to be approximately 8mm thick.

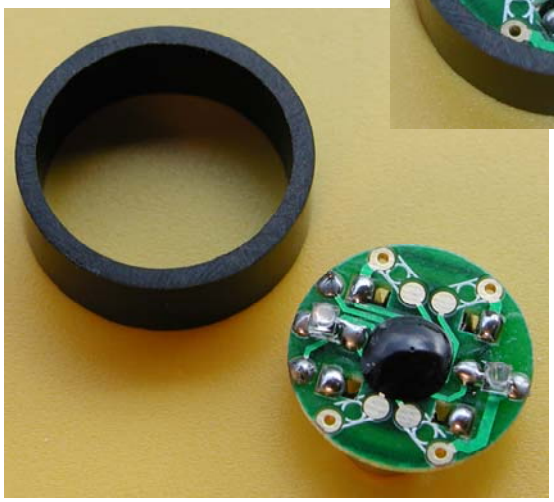
- A paper template should then be used to provide an outline around which to cut. The design should then be cut out using a jigsaw.

- The front and back of the design have been made from 1mm vacuum forming plastic (HIPS). Two pieces of HIPS should be joined together using double sided tape. Onto this should be placed the same template used for cutting the wooden section.

- After cutting and finishing the HIPS to shape, the holes for the LEDs need to be drilled.

- Finally, assemble the design with the telephone module inside. The HIPS should be attached to the wooden core by using double-sided tape. This will produce a very clean finish and, will allow for battery replacement.

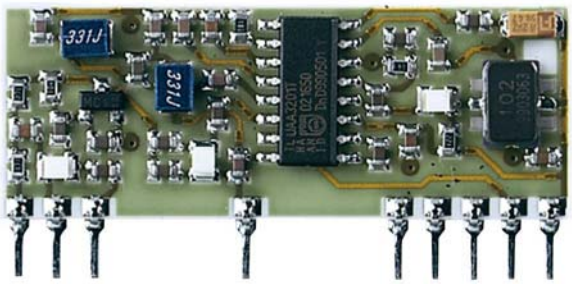
The designs below use tubing for the case. In the first example the tubing is 25mm conduit. This is inexpensive and easy for students to produce a quality outcome with. The tube ends have been capped with a disc of 1mm HIPS. One cover is clear and a sticker has been added to give a football theme. The flashing LED's can easily be seen through the protective cover.



The final design was created using 25mm acrylic tubing. The top is translucent through which it is easy to see the LEDs flashing. The top has been decorated using adhesive star shapes.

SURFACE MOUNT

The increasing demand for smaller electronic devices has led to a reduction in the size of components. The latest development in the construction of electronic circuits has been the development of SMT or surface mount technology.



Surface mount components are used in mobile phones and portable CD players. In fact they can now be found in most electronic devices.

Through hole component

Surface mount component

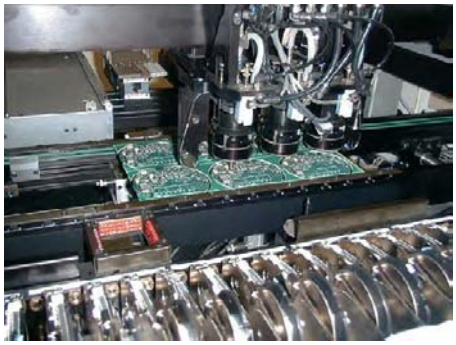
Unlike conventional components, which have leads that pass through holes in the PCB and are soldered on the track, surface mount components are designed to be soldered directly onto the printed circuit board on the same side as the track. The design and manufacture of SMT circuits is therefore much easier and faster.

The diagrams to the left show the contrast between the conventional through-the-hole construction and surface mount construction.

Surface mount components are also smaller than conventional components. The smallest resistors measure 1.6mm by 0.8mm and need specialised production machines to manufacture the circuits.

SURFACE MOUNT PRODUCTION

Surface mount components are designed to be assembled on specialised production machines. These machines are often called pick and place machines. The components are loaded into the machines in reels, as can be seen in the diagram on the right.



The first stage of the production process is to place a small amount of solder paste onto the pad where the component is to be joined. The component is then picked from the tape and placed in position on the circuit board. Since the solder paste is tacky it will hold the components in place until they are soldered.

The circuit boards are then placed inside a reflow oven, which raises the temperature of the board above the melting point of the solder for a few seconds. When the solder paste melts it joins the pad and component.

TASKS

1. *Make a list of products found in your home that use surface mount components.*

2. *List the advantages and disadvantages of using surface mount components*

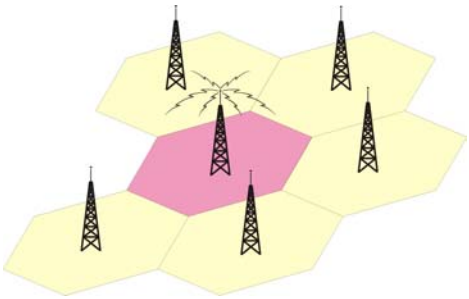
HOW MOBILE PHONES WORK

The mobile phone is a common piece of equipment that we all regard as an essential tool for keeping in touch whilst out and about. Millions of phones are sold each year and the sophistication of these phones is improving each day.

The first telephone was invented by Alexander Graham bell in 1876 this relied on wire to carry the signal. The first wireless communication was invented by Murhead and was commercially developed by Guglielmo Marconi in 1894. Mobile phones are modern combinations of these two technologies.

NETWORK

In order to use a mobile phone a series of transmitters generate a network of radio signals across the country. These transmitters are called Base Stations and they divide the country into a series of cells. In cities these cells tend to be small, around 400m square. In the countryside they can be as large as 20 square miles. The size of each cell across the country depends upon the number of people and the surrounding geography.



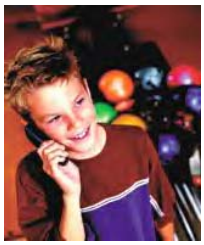
As you move around the country your mobile phone will change the cell it communicates with. The cells have been designed to overlap. When you come to the edge of a cell the network determines where the next cell with the strongest signal can be found, and will transfer your call through this cell.

PHONES

A mobile phone is a portable handset that allows you to transmit and receive signals with a mobile communications network. Mobile phones are very sophisticated electronic devices capable of processing millions of bits of information per second to allow us to communicate. The circuit required for a modern mobile phone would 20 years ago have filled an entire room.

The style and design of handsets has changed dramatically since the earliest designs of the 1980s. These used to be large and consumed a great deal of power. The early mobile phones were also very expensive to buy and operate. Since the cost has fallen over the last ten years and the handsets have become smaller, more people are now able to own mobile phones.

ELECTROMAGNETIC RADIATION



Concern has been raised in recent years over amount of the electromagnetic radiation emitted whilst using a mobile phone. Scientists have yet to decide if there are any long-term health risks of using mobile phones. Concern is also being raised over the positioning of mobile phone masts.

TASKS

1. *The next generation of mobile phones are soon to be released. What new features are these new phones likely to include?*

2. *You have been asked by a manufacturer to design a new concept phone that would appeal to young people as a fashion item. Produce a series of designs and model your favourite.*

3. Mobile phone use can often seem intrusive to other people. Write a simple code for their use and design a poster to highlight your points.

EVALUATION

Evaluation is an important part of the design process. It is used by designers to check they have produced an effective design with all the features they identified in the specification. When you are evaluating a product you are trying to find out both its good and poor features.

Your own opinions are important, but you must also get some other peoples opinions as well. They may notice qualities you are not aware of.

TASK

Evaluate your project by establishing if it meets your specification.
Look at your specification and write down in the boxes below two features to establish the quality of your finished product.

1.

2.

TASK

Sketch how your final design could be improved.

PROGRESS DIARY

Each week, write a short paragraph about the work you have done. As well as commenting on good aspects of the lesson, try to comment on work that has not gone so well, or that you did not fully understand.

When designing, it is also important to think ahead. Write down in the second section what work you anticipate doing next week on your project.

Week 1	TODAY _____
	NEXT LESSON
Week 2	TODAY _____
	NEXT LESSON
Week 3	TODAY _____
	NEXT LESSON
Week 4	TODAY _____
	NEXT LESSON
Week 5	TODAY _____
	NEXT LESSON
Week 6	TODAY _____
	FINALCOMMENT:

Teacher comments:

MOBILE PHONE MODULE

A mobile phone is now a common device that we all regard as an essential tool for keeping in touch whilst out and about. Millions of phones are sold each year and the majority of students in schools will have access to one.

The mobile phone module provides teachers with a stimulating project through which students can examine the latest communications technology.

Used in its standard form, the mobile phone module is a small circuit that will flash a series of LED's when an incoming signal is detected. A series of additional contacts are provided on the module so that additional LED's or external connections can be added, so that the module can also be used to trigger other circuits.

The project material provides research information on how mobile phones work. The material also looks at surface mount component technology.

A key feature of the teaching material is that it contains student and teacher notes. The resource is designed to be photocopied. The activity sheets can be used independently from the project. Included with the notes for students are a series of structured homework assignments that have links to web sites for more detailed information.

A series of lesson plans have been included. The times suggested are for typical KS3 group sizes. However, detailed lesson timings will depend upon timetable, workshop facilities and student needs. The practical work should be achievable in a typical secondary workshop.

PROJECT AIMS

- Appreciation of surface mount technology
- Appreciation of mobile phone communications
- Experience in working with and combining a range of materials
- Skills in the design and manufacture of prototypes
- The use of ICT to help represent ideas

CONCEPTS

- Design and manufacture of electronic products
- Prototype modelling
- Communication skills
- Computer aided design

SCIENCE OPPORTUNITIES

- Understanding of electromagnetic radiation
- Possible dangers of electromagnetic radiation

MATHS

- Accurate measuring and marking out

ICT

- Use ICT to gather research material
- Graphic packages to help present design ideas

ART

- Drawing and presentational techniques to help represent design ideas

PROJECT SECTIONS

SESSION 1 INTRODUCTION AND MOBILE PHONE TECHNOLOGY

Aim:

- Introduction to project.
- Research mobile phones
- Write Design Brief.

Student:

- Identify design situation.
- Write design brief.
- Research into mobile phone technology and style

Teacher:

- Help with identification of design situation.
- Assist in the writing of the design brief.

Demonstrations:

- A selection of mobile phone designs to contrast styles and technology
- A range of completed phone indicators projects

Resources:

- Example of a completed mobile phone project.
- "How a mobile phone works" sheet.
- Mobile phones
- Access to Library/books/Internet for research information.

Homework:

- Selected task from "How a mobile phone works" sheet.
- Diary record.

SESSION 2 SURFACE MOUNT TECHNOLOGY AND DESIGN IDEAS

Aim:

- Understanding of surface mount technology.
- Design of circuit case

Student:

- Examine surface mount circuits and devices
- Design of circuit case.

Teacher:

- Introduction to surface mount technology.
- Initiation of design ideas for circuit case.
- Assistance with work based on surface mount technology

Demonstrations:

- Surface mount circuits/devices
- Construction techniques and materials used with surface mount components

Resources:

- Selection of surface mount components/devices.
- Surface mount activity sheet.
- Initial ideas design sheet.

Homework:

- Selected Tasks from activity sheet.
- Diary record.

SESSION 3 CASING MANUFACTURE/ASSEMBLY

Aim:
- Construction assembly of casing design.

Student:
- Manufacture case design.
- Install circuit in case.

Teacher:
- Provide support if students wish to solder additional components to PCB.
- Assist students in the fitting of their circuits into the case

Demonstrations:
- How to assemble circuit into case.
- Case construction techniques.

Resources:
- Examples to use in demonstrations for assembly of circuit into case.
- Cases for students.
- Workshop tools for cutting, shaping and finishing.

Homework:

- Diary record

SESSION 4 EVALUATION/EXTENSION ACTIVITY

Aim:
- Completion of project manufacture.
- Evaluation of project and student progress.

Students:
- Completion of project assembly.
- Evaluation against specification.
- If sufficient time – Extension exercises based on using the telephone module to trigger other circuits.

Teacher:
- Help with final project assembly.
- Discussion on important feature to include in project evaluations.
- Guidance on extension activity.

Demonstrations:
- Project evaluation exercise

Resources:
- "Evaluation" activity sheet

Homework:
- Diary record and final project evaluation.
- Extension activity.

NOTE:
It is suggested in the lesson plans that the project will cover 4 sessions of approximately 2 hours each in duration.

NATIONAL CURRICULUM 2000

DESIGN AND TECHNOLOGY
Programme of Study Key Stage 3

During key stage 3 pupils use a wide range of materials to design and make products. They work out their ideas with some precision, taking into account how products will be used, who will use them, how much they cost and their appearance. They develop their understanding of designing and making by investigating products and finding out about the work of professional designers and manufacturing industry. They use computers, including computer-aided design and manufacture (CAD/CAM) and control software, as an integral part of designing and making. They draw on knowledge and understanding from other areas of the curriculum.

KNOWLEDGE SKILLS AND UNDERSTANDING

Developing, planning and communicating ideas

1. Pupils should be taught to:
   a. Identify relevant sources of information, using a range of resources including ICT
   b. Respond to design briefs and produce their own design specifications for products
   c. Develop criteria for their designs to guide their thinking and to form a basis for evaluation
   d. Generate design proposals that match the criteria
   e. Consider aesthetics and other issues that influence their planning
   f. Suggest outline plans for designing and making, and change them if necessary
   g. Prioritise actions and reconcile decisions as a project develops, taking into account the use of time and costs when selecting materials, components, tools, equipment and production methods
   h. Use graphic techniques and ICT, including computer-aided design (CAD), to explore, develop, model and communicate design proposals

Working with tools, equipment, materials and components to produce quality products

2. Pupils should be taught:
   a. To select and use tools, equipment and processes, including computer-aided design and manufacture (CAD/CAM), to shape and form materials safely and accurately and finish them appropriately
   b. To take account of the working characteristics and properties of materials and components when deciding how and when to use them
   c. To join and combine materials and ready-made components accurately to achieve functional results
   d. To make single products and products in quantity, using a range of techniques, including CAD/CAM to ensure consistency and accuracy
   e. About the working characteristics and applications of a range of modern materials, including smart materials.

Evaluating processes and products

3. Pupils should be taught to:
   a. Evaluate their design ideas as these develop, and modify their proposals to ensure that their product meets the design specification
   b. Test how well their products work, then evaluate them
   c. Identify and use criteria to judge the quality of other people's products, including the extent to which they meet a clear need, their fitness for purpose, whether resources have been used appropriately, and their impact beyond the purpose for which they were designed

NATIONAL CURRICULUM

Knowledge and understanding of materials and components

4. Pupils should be taught:
   a. To consider physical and chemical properties and working characteristics of a range of common and modern materials
   b. That materials and components can be classified according to their properties and working characteristics
   c. That materials and components can be combined, processed and finished to create more useful properties and particular aesthetic effects
   d. How multiple copies can be made of the same product.

Knowledge and understanding of systems and control

5. Pupils should be taught:
   a. To recognise inputs, processes and outputs in their own and existing products
   b. That complex systems can be broken down into sub-systems to make it easier to analyse them, and that each sub-system also has inputs, processes and outputs
   c. The importance of feedback in control systems
   d. About mechanical, electrical, electronic and pneumatic control systems, including the use of switches in electrical systems, sensors in electronic switching circuits, and how mechanical systems can be joined together to create different kinds of movement
   e. How different types of systems and sub-systems can be interconnected to achieve a particular function
   f. How to use electronics, microprocessors and computers to control systems, including the use of feedback
   g. How to use ICT to design sub-systems and systems.

Knowledge and understanding of structures

6. Pupils should be taught:
   a. To recognise and use structures and how to support and reinforce them
   b. Simple tests and appropriate calculations to work out the effect of loads
   c. That forces of compression, tension, torsion and shear produce different effects.

Breadth of study

7. During the key stage, pupils should be taught the Knowledge, skills and understanding through:
   a. Product analysis
   b. Focused practical tasks that develop a range of techniques, skills, processes and knowledge
   c. Design and make assignments in different contexts. The assignments should include control systems, and work using a range of contrasting materials, including resistant materials, compliant materials and/or food.