sistor & Diode Part Numbering Codes

ectron, JEDEC & JIS are industry schemes for numbering semiconductor s: diodes, bipolar transistors & FETs - they enable sourcing of devices fferent manufacturers.

stor Tutorial Includes:
basics Gain: Hfe, hfe & Beta Transistor specifications BJT Early Effect Transistor and diode g codes Choosing replacement transistors

component data: Transistor component data

many thousands of different types of diode, bipolar transistor and FET. These semiconductor devices have haracteristics according to the way they are designed and made.

It it is essential that the different semiconductor devices are given different part numbers to distinguish them other.

BC547 transistor - BC in the part number indicates it is a silicon audio frequency low power transistor

anufacturers had to give their own numbers to devices, but soon standard part numbering schemes were emiconductor devices including diodes, bipolar transistors and FETs - both JFETs and MOSFETs.

dustry standard numbering schemes for semiconductor devices has many advantages, not only for large nufacturers of electronic equipment right down to the hobbyist and student.

ugh there are standard numbering systems these days, there are many specialised transistors and other uctor devices on the market, and these often carry the makers individual part numbers on them. Fortunately hese are easily identifiable as the devices from particular manufacturers.

the rise of the Internet, the specifications and other details of transistors and many other electronic nts are easily found and their full data-sheets can be viewed. Despite this, it is still a very convenient to nd transistor numbering schemes from which it is easy and quick to understand their broad performance.

conductor device numbering / coding schemes

many different ways of organising a numbering scheme. In the early days of thermionic valve (vacuum nufacture, each manufacturer gave a number to the types they manufactured. In this way there were vast of different numbers for devices many of which were virtually identical. It soon became obvious that a more l approach was required, so that the same device could be bought regardless of the manufacturer.

FOLLOW

14 JUNE 2025

Fact of the day: It was in this month in 1916 that W Schottky in Germany described the principle of the superhet radio as a powerful and selective amplifier. He never made the receiver to prove his idea and was beaten to this goal by Edwin Armstrong. Also on this day in 1923, Charles Jenkins, an inventor from Dayton, Ohio, who invented a mechanical television system called radiovision and claimed to have transmitted the earliest moving silhouette images.

Quote: *Science can purify religion from error and superstition. Religion can purify science from idolatry and false absolutes.* Pope John Paul II (Karol Wojtyla)

Point to ponder: A photon that takes eight minutes to travel from the Sun to Earth took 100,000 years to get from the centre to the surface of the Sun.

e is true for semiconductor devices, and manufacturer independent numbering schemes are used for diodes, ansistors and FETs. In fact there a few semiconductor numbering schemes in use:

'ectron numbering scheme This diode, bipolar transistor and FET numbering scheme was originated in e and is widely used for transistors developed and manufactured here.

C numbering scheme This diode and transistor numbering scheme was originated in the USA and it is used for diodes and transistors that originate from North America.

umbering scheme This semiconductor device numbering system was developed in Japan and can be on diodes, transistors and FETs that are made in Japan.

facturers own schemes: There are some devices, particularly specialised bipolar transistors and some for which individual manufacturers may wish to retain all the manufacturing rights. They may not want to up the specifications and manufacturing methods to others is they are using a technique they have oped. In these and similar instances, manufacturers will use their own part numbering schemes that do not m to the industry standard schemes

of the the industry standard numbering schemes is to allow for the identification and description of electronic nts and in this case semiconductor devices including diodes, bipolar transistors and field effect transistors, ommon electronic components and component numbering across several manufacturers. To achieve this, urers register a definition for new electronic components with the relevant agency and then receive a new ber.

oach enables electronic equipment manufacturing companies to have second sources for their components s way assure the supply for large scale manufacturing and also to reduce the effects of obsolescence.

g degrees these numbering schemes allow for a broad description of the function of the diode, transistor he Pro-Electron scheme providing far more information than the others.

Electron or EECA Numbering Coding System

Electron numbering scheme to provide a standardised scheme for semiconductor numbering - in particular ansistors and field effect transistors was set up in 1966 at a meeting in Brussels, Belgium.

me for the numbering of semiconductor diodes, bipolar transistors and FETs was based around the format tem developed by Mullard and Philips for thermionic valve or vacuum tube numbering that had existed since 1930s. In this the first letter designated the heater voltage and current, the second and subsequent letters dual functions within the glass envelope and the remaining numbers indicated the valve based and the serial or the type.

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Electron scheme took this and used letters that were seldom used for the heater descriptions to designate onductor type and then used the second letter to define the function. Similarities existed between the valve / gnations and those used for the semiconductor devices. For example, "A" was used for a diode, etc.

me was widely used and in 1983 its management was taken over by the European Electronic Component urers Association, EECA.

er

ermanium

icon

allium Arsenide

ompound materials

etter

ode - low power or signal

ode - variable capacitance

ansistor - audio frequency, low power

ansistor - audio frequency, power

nnel diode

ansistor - high frequency, low power

iscellaneous devices

ode - sensitive to magnetism

ansistor - high frequency, power

notocoupler

ght detector

ght emitter

witching device, low power, e.g. thyristor, diac, unijunction

ansistor - switching low power

witching device, low power, e.g. thyristor, triac

ansistor - switching, power

urface acoustic wave device

ode multiplier

ode rectifying

ode - voltage reference

ent characters

acters following the first two letters form the serial number of the device. Those intended for domestic use e numbers, but those intended for commercial or industrial use have letter followed by two numbers, i.e. A10

occasions there may be a suffix letter that is added:

v gain

edium gain

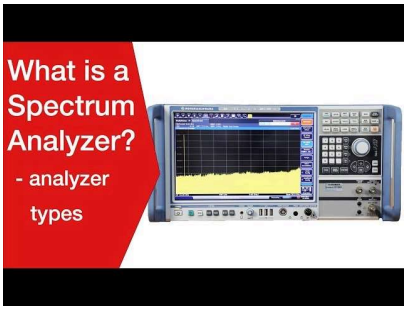
gh gain

fix = gain unclassified

eful to both manufacturers and users because when transistors are manufactured, there is a large spread in of gain. They can then be sorted into groups and marked according to their gain.

numbering scheme it can be seen that a transistor with the part number BC107 is a silicon low power audio tor and a BBY10 is silicon variable capacitance diode for industrial or commercial use. A BC109C for s a silicon low power audio transistor with a high gain

EC Numbering or Coding System



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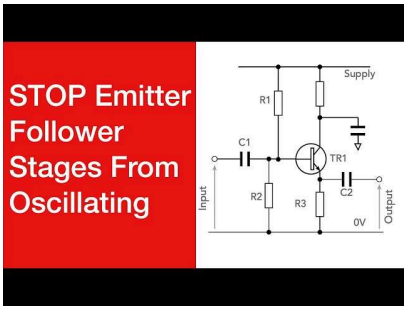

STOP Emitter Follower Circuits From Oscillating

Joint Electron Device Engineering Council is an independent industry semiconductor engineering trade on and standardisation body. It provides many functions, one of which is the standardisation of uctor, and in this case, diode, bipolar transistor and field effect transistor part numbering.

est origins of JEDEC can be traced back to 1924 when the Radio Manufacturers Association was ed - many years later this became the Electronic Industries Association, EIA. In 1944, the Radio urers Association and the National Electronic Manufacturers Association established a body called the Joint Tube Engineering Council, JETEC. This was set up with the aim of assigning and coordinating type numbers n tubes, (thermionic valves).

Radio equipment

ncreasing use of semiconductor devices, the scope of JETEC was broadened and it was renamed JEDEC, tron Device Engineering Council in 1958.

nbering of the semiconductor devices followed the broad outlines of the tube of valve numbering scheme been developed: "1" stood for "No filament / heater" and the "N" stood for "crystal rectifier".

digit for semiconductor device numbering was repurposed from indicating no filament to the number of PN in the semiconductor device, and the numbering system was described in EIA/JEDEC EIA-370.

lumber =

Diode

Bipolar transistor or single gate field effect transistor

Dual gate field effect transistor

umber equates to the number of junctions, although this has to be interpreted a little for MOSFETs.

d Letter = N

quent numerals = Serial number

evice with the numbering code 1N4148 is a diode and a 2N706 is a bipolar transistor.

es extra letters are added to the part number and these often refer to refer to the manufacturer. M means the urer is Motorola, while TI means Texas Instruments, although an A added to the part number often means a f the specification, e.g. 2N2222A transistors are widely available and these are an updated version of the nterpreting these numbers sometimes requires a little background knowledge.

emiconductor device numbering scheme

nese Industrial Standards, JIS part numbering scheme for semiconductor devices is standardised under l2.

me uses a type number that comprises of a number followed by two characters and then this is followed by umber.

Electronics store

nber

umber indicates the number of junctions int he semiconductor device.

ode

olar transistor or single gate field effect transistor

al gate field effect transistor

n positions 2 & 3

PNP high frequency bipolar transistor

PNP audio frequency bipolar transistor

NPN high frequency bipolar transistor

NPN audio frequency bipolar transistor

Diodes

Thyristor (SCR)

Gunn devices

JJT (Unijunction transistor)

P-channel JFET / MOSFET

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N-channel JFET / MOSFET

Triac

LED

Rectifier

Signal diode

Avalanche diode

Varactor diode / varicap diode

Zener diode / voltage reference diode

mber

l number follows the first digit and the two semiconductor device type letters. The numbers run between 10
.

the serial number a suffix can be used to indicate the device has been type approved, i.e. there is a
e that it has been manufactured under the right conditions to produce the required semiconductor device.

ufacturer numbers

he fact that there are industry organisations in place to generate device numbers, some manufacturers
produce devices that were unique to them. In some areas it would provide a device with a unique selling
other manufacturers could not copy.

miconductor devices numbers are unique to the manufacturer and as a result they can be used to identify
e.

mmon examples are given below:

Motorola power, metal case

Motorola power, plastic case

Motorola low power, plastic case

Motorola RF transistor

Texas Instruments power transistor (plastic case)

TI planar power transistor

TI small signal transistor (plastic case)

Ferranti

Ferranti

electron transistor and diode numbering or coding system provides more information about the device, than
C system. However both of these diode and transistor numbering schemes are widely used and enable the
vice types to be made by a number of manufacturers. This enables equipment manufacturers to buy their
uctors from a number of different manufactures and know that they are buying devices with the same
istics.

PREVIOUS PAGE NEXT PAGE

Written by **Ian Poole** .
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