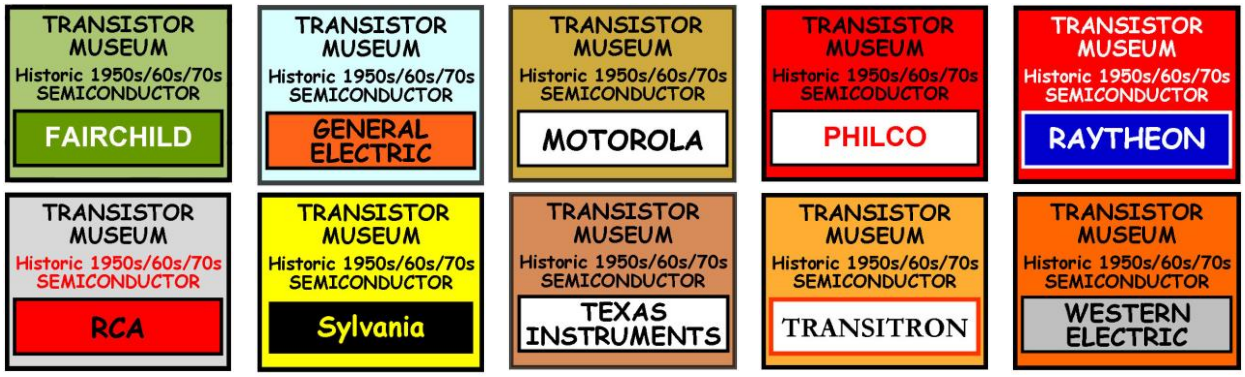
TRANSISTOR MUSEUM™

HISTORIC SEMICONDUCTORS

RESEARCH AND COLLECTING KIT WITH 50 HISTORIC SEMICONDUCTORS FROM THE 1950s/1960s/1970s

DESIGNED FOR THE HISTORIAN, ENGINEER, RESEARCHER AND SEMICONDUCTOR HOBBYIST

INCLUDED ARE VINTAGE, HISTORIC AND COLLECTABLE DEVICES FROM THESE PIONEERING MID 20th CENTURY SEMICONDUCTOR MANUFACTURERS



START YOUR OWN COLLECTION OF HISTORIC SEMICONDUCTORS. INCLUDED ARE ADDITONAL MATERIALS FOR RESEARCHING AND EXPANDING YOUR COLLECTION.

ABOUT THIS BOOK
AND THE TRANSISTOR MUSEUM™

This book is one of a continuing series of semiconductor research and collecting kits developed by the Transistor Museum™. The **Historic Semiconductors Research and Collecting Kit** provides comprehensive technical descriptions, historical commentary and timelines, and photographs of the famous diodes, transistors and integrated circuits that were first developed in the 1950s, 1960s and 1970s and have had a profound effect on the world of electronics ever since. This is a subject that should be of great interest to the modern-day technology historian, engineer, researcher and electronics hobbyist.

An additional feature of this unique Transistor Museum kit is that included are 50 vintage, historic and collectable mid-20th semiconductors manufactured by ten of the best known and pioneering companies from the 1950s through the 1970s. The 50 semiconductors (including various technologically significant versions of diodes, transistor and ICs) are each stored in a presentation envelope with an associated data card. This type of collecting kit is unique in the world of historic semiconductor research and has been developed to provide an enjoyable learning experience.

The Transistor Museum™ is a virtual museum that has been developed to help preserve the history of the greatest invention of the 20TH century – the TRANSISTOR. You can visit the museum on the web at:

http://www.transistormuseum.com

First Edition - October 2014

TRANSISTOR MUSEUM™

HISTORIC SEMICONDUCTORS RESEARCH AND COLLECTING KIT

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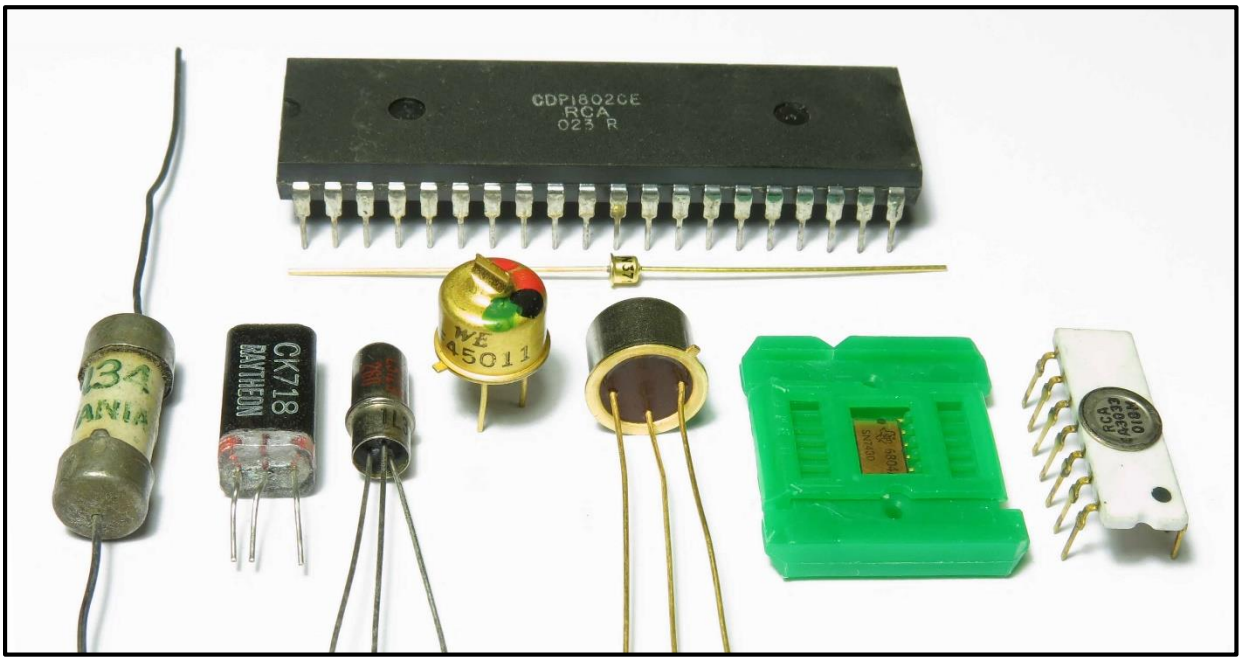
HISTORIC SEMICONDUCTORS RESEARCH AND COLLECTING KIT

DESCRIPTION OF YOUR RESEARCH AND COLLECTING KIT

This book is one of a continuing series of semiconductor research and collecting kits developed by the Transistor Museum. The **Historic Semiconductors Research and Collecting Kit** provides comprehensive technical descriptions, historical commentary and timelines, and photographs of the famous diodes, transistors and integrated circuits that were first developed in the 1950s, 1960s and 1970s and which have had such a profound effect on the world of today's electronics. This wealth of research information should be of great interest and value to the modern-day historian, engineer, researcher and electronics hobbyist. Also included in this unique Transistor Museum kit are 50 vintage, historic and collectable mid-20th century semiconductors, all documented with key data and photographs.



Shown above are examples of the historic semiconductor types included with this kit. At far left is a Sylvania 1N34 germanium diode, from the late 1940s, which was the first commercially available crystal diode. At top is an RCA 1802, one of the first microprocessors from the 1970s. The other devices shown illustrate the magnitude of progress in semiconductor technology during this timeframe, starting with 1950s germanium transistors (lower left - Raytheon CK718, Philco Surface Barrier and WECO diffused base), 1960s silicon transistors (Fairchild 2N1613 planar device), first 1960s ICs (TI Solid Circuit and RCA CMOS), and unique technologies such as the 1960s tunnel diode (GE gold axial 1N3712 shown below the RCA 1802).

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HISTORIC SEMICONDUCTORS RESEARCH AND COLLECTING KIT

The included historic semiconductors are examples of important technologies and represent device types manufactured by ten of the best known and pioneering semiconductor device companies from this time period. Each of these technologically significant examples of diodes, transistors and ICs is stored in a presentation envelope with an associated data card. This type of collecting kit is unique in the world of historic semiconductor research and has been developed to provide an enjoyable learning experience and an unparalleled opportunity to begin and then expand your collection.

What's included:

- 50 historically significant semiconductors from the 1950s-1970s
- Devices from 10 of the key mid-century semiconductor manufacturers illustrated on the front cover
- Storage and presentation envelopes for each device
- Historic semiconductor data cards for each device
- Photographs and technical descriptions for each device
- Additional storage and presentation envelopes and data cards to expand the initial collection of 50 devices
- Protective storage box for this complete kit, including all devices and documentation
- This comprehensive and highly illustrated 50+ page book in hardcopy version and also as an online pdf
- An extensive bibliography of websites and publications to aid you in researching and expanding your collection
- Informative discussion, facts and photographs documenting a "Brief History of Early Semiconductors"
- Access to the online Transistor Museum for additional research material and more available historic semiconductors

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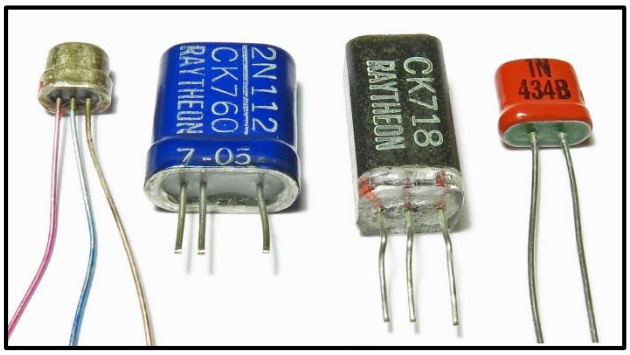

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Raytheon CK718 transistor
Type: Germanium PNP alloy junction
Case Color/Style: Black epoxy
Vintage/Date Code: 1952-1955
Use: Body style hearing aids
Notes: First transistor in volume production.
60+ year old historic device.

EXAMPLE OF THE KIT CONTENTS

Each historic semiconductor has been researched by the Transistor Museum, and key data about the device is documented on a business-card sized "Data Card". Show above is the back side of the data card for the Raytheon CK718 transistor, one of the oldest devices (60+ years) in your collection. Each device is stored in a protective plastic display envelope (shown at left is a Raytheon "Blue" transistor), along with the data card for the device to allow easy access to relevant information. Also provided is a larger manila storage envelope (identified with the company name) that is used to store the devices from each specific manufacturer. The kit contains at least four semiconductors from each of the identified 10 companies – shown at upper left are examples of the four historic devices from Raytheon, which was a leading 1950s germanium transistor company.

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HISTORIC SEMICONDUCTORS RESEARCH AND COLLECTING KIT

COMPLETE LIST OF THE HISTORIC SEMICONDUCTORS INCLUDED IN YOUR KIT

Fairchild	Silicon transistors: 2N696, 2N1613, 2N4124
	Integrated circuit (RTL) : uL923
General Electric	Germanium transistor: 2N107
	Germanium tunnel diode: 1N3712
	Silicon unijunction transistor: 2N491/492
	Silicon transistor: D43C5
Motorola	Germanium transistors: 2N1004, USN 2N705
	Silicon transistors: MPSU03, 2N2222
Philco	Germanium transistors: L5129, 2N1500, 2N2375
	Silicon transistor: 2N858-862
Raytheon	Germanium transistors: CK718, CK78X, Blue Case
	Silicon diode: 1N434B
RCA	Germanium transistors: 2N109, 2N404
	Integrated circuit (CMOS): CA/CD series
	Microprocessor: Cosmac 1802
Sylvania	Germanium diode: 1N34
	Germanium transistor: 2N35
	Silicon transistor: 2N708
	Integrated circuit (SUHL) SG52
Texas Instruments	Germanium transistor: R212
	Silicon transistors: Type 950, 2N33X
	Integrated circuit (TTL): SN7430F
Transitron	Germanium diode: S775G-1
	Silicon transistors: 2N343, 2N2905, Embossed Case
Western Electric	Germanium diode: 400A/1N43
	Germanium transistors: Type 12, 2N559, GF45011
Plus 10 Additional Selected Historic Semiconductors	This kit includes 10 historic semiconductors (two envelopes of five devices each) that have been identified by company name, but which still require additional research on your part to complete the data card. We've included these devices as a first step (hopefully enjoyable) to support your ongoing research into the exciting world of semiconductor history.

PHOTOS AND DATA CARDS OF YOUR HISTORIC SEMICONDUCTORS

To aid in the identification of the devices included in the kit, and also to document key facts about each device type, the following section of this book contains photographs and research commentary on each included semiconductor. This information should provide a solid basis for understanding the historical relevance of your devices and for expanding your collection with newly acquired types.

The 50 historic semiconductors in your kit are all from the 1950s-1970s timeframe, which includes the late 1940s and the early 1980s. The Vintage/Date Code information listed on each data card is the range of dates best associated with the device type (Vintage) or the actual date of manufacture of the device (Date Code) included in your kit.

The Transistor Museum has devoted years of research and collecting of historic semiconductors in order to make unique kits such as this one available to the public. All the devices are physically intact, unused or removed from historic equipment such as hearing aids and radios, and clearly identified either by legible markings of the device itself or by additional research information on the associated data card.

A Word About the Electrical Performance of Your Historic Semiconductors:
The historic devices in this kit are all quite ancient, ranging in age from 60+ years for early types such as the Sylvania 1N34 diode to 30+ years for later types such as the RCA 1802 microprocessor. Because of factors such as moisture penetration through plastic cases or poorly sealed enclosures, ESD damage to sensitive junctions, and wide variation in performance for early types, the Transistor Museum cannot guarantee that these historic devices will meet original electrical specifications. These specific semiconductors have been included in the kit because they are all truly historic and collectable devices, based on date of manufacture, device type, physical condition and manufacturer - but not based on specified electrical performance. The researcher/collector should contact the Transistor Museum directly with all requests for historic devices for which electrical performance is important.

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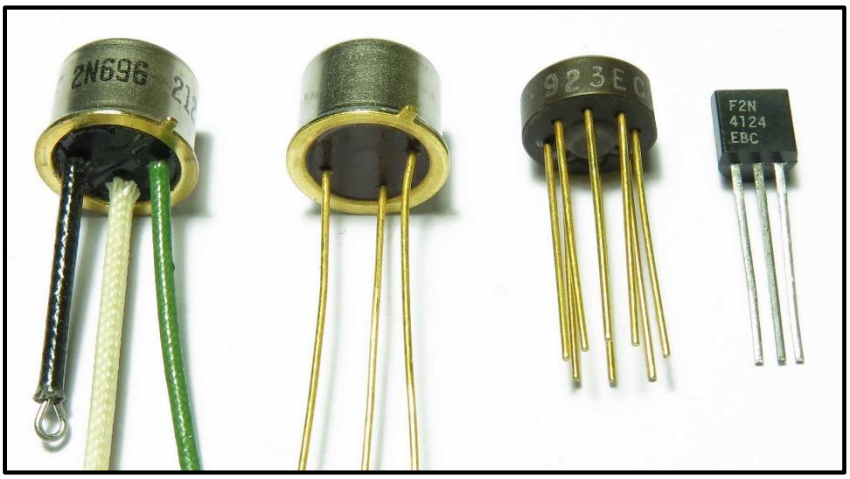


FAIRCHILD HISTORIC SEMICONDUCTORS

2N696 TRANSISTOR: The 2N696/697 were Fairchild's first commercial transistors, released in 1958. Very successful product, second-sourced by many companies. Early development units sold to IBM for $200 each. The devices in this kit are dated 1962.

2N1613 TRANSISTOR: The Fairchild 2N1613 was the first commercial planar transistor, released in 1960. The planar technology was developed by Dr. Jean Hoerni at Fairchild and provided the basis for passivated surface silicon structures used in modern semiconductor devices. The 2N1613 transistors in this kit are unmarked and originated in Fairchild order - P62189, dated 1965 week 42.

uL923 IC: Beginning in 1961, Fairchild offered one of the first commercially available lines of integrated circuits. These ICs implemented basic logic functions and used a type of circuitry known as RTL (Resistor Transistor Logic). The 923 is an RTL IC containing 15 transistors.

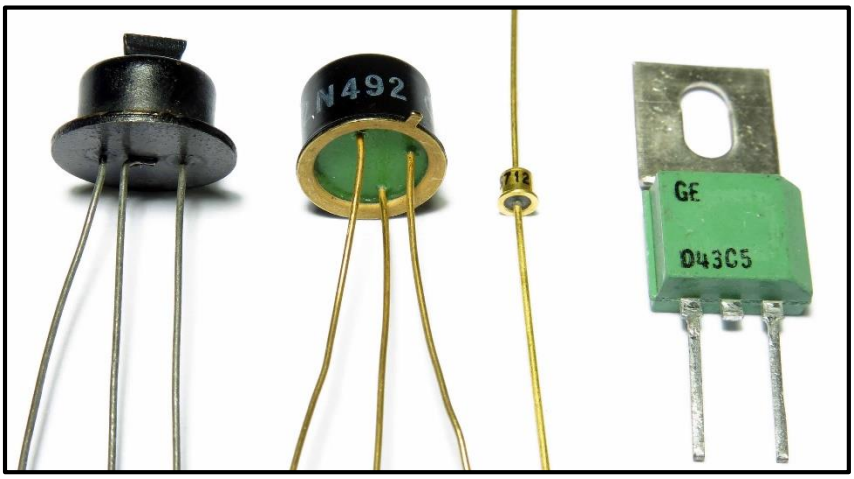
2N4124 TRANSISTOR: Fairchild, Motorola and Texas Instruments were pioneers in developing and refining the highly successful TO-92 plastic transistor case style in the mid-1960s. Plastic cases allowed for lower cost and greater automation in transistor production. The devices in this kit are early units, dated from the 1960s.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Fairchild 2N696 transistor
Type: Silicon NPN double diffused
Case Color/Style: Silver metal TO-5
Vintage/Date Code: 1960s
Use: General purpose amplifer/oscillator
Notes: One of the first Fairchild types, with initial devices available in the late 1950s.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Fairchild 923 Micrologic
Type: Silicon RTL Integrated Circuit
Case Color/Style: Black plastic TO-5
Vintage/Date Code: 1960s/1970s
Use: Industrial JK Flip-Flop to 2.0 MHz
Notes: Early example of RTL integrated circuit. 40+ year old historic IC device.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Fairchild 2N1613 transistor
Type: Silicon NPN diffused planar
Case Color/Style: Silver metal TO-5
Vintage/Date Code: 1960s/1970s
Use: The first "Universal Transistor"
Notes: Fairchild's planar process was key to modern semiconductor development.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Fairchild 2N4124 transistor
Type: Silicon NPN diffused planar epitaxial
Case Color/Style: Black plastic TO-92
Vintage/Date Code: 1960s/1970s
Use: General purpose amplifier/switch
Notes: TO-92 plastic case was first used in mid 1960s. This model is an early example.



GENERAL ELECTRIC HISTORIC SEMICONDUCTORS

2N107 TRANSISTOR: GE was an early manufacturer of rugged germanium transistors, beginning in late 1953. Fallouts from production testing were sold to hobbyist as the 2N107. The 2N107 transistors in this kit are unmarked and originated in a bulk mid-1950s fallout lot from the GE germanium alloy junction production line.

2N491/492 UNIJUNCTION TRANSISTOR: Originally known as the "double-base diode", the unijunction transistor was invented at the General Electric Electronics Lab in Syracuse in the early 1950s. The unijunction exhibits an unusual performance characteristic known as negative resistance, ideal for oscillator circuits.

1N3712 TUNNEL DIODE: The tunnel diode is a truly unique semiconductor, with a number of interesting characteristics and an unusual historical past. Developed by Leo Esaki at Sony in 1957, and made public in 1958, the tunnel (or Esaki) diode was the first device that demonstrated the validity of quantum physics. Also, like the unijunction and point contact transistors, the tunnel diode exhibits negative resistance.

D43C5 TRANSISTOR: This unit is from GE's very popular line of medium power silicon transistors, developed in the mid-1960s, which was offered in a variety of power and gain versions. The unique color-coded silicone plastic case with integral copper "Power Tab" heat sink resulted in highly reliable and low cost transistors.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: GE 2N107 transistor
Type: Germanium PNP alloy junction
Case Color/Style: Black metal pinch-top
Vintage/Date Code: 1950s
Use: Hobbyist audio
Notes: Production "fallouts" sold as hobby device. Pinch-top evac tube used in 1950s.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: GE 1N3712 tunnel diode
Type: Germanium quantum tunneling
Case Color/Style: Gold axial submini
Vintage/Date Code: 1960s/1970s
Use: High speed logic & uhf oscillator
Notes: Unique technology developed by Esaki at Sony. GE was major US manuf.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: GE 2N491/2N492 transistor
Type: N-type silicon bar unijunction
Case Color/Style: Black metal TO-5
Vintage/Date Code: 1950s/1960s
Use: Timers, oscillators, SCR triggers
Notes: Unique technology developed at GE in 1956. Also known as double-base diode.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: GE D43C5 transistor
Type: Silicon PNP planar passivated
Case Color/Style: Green silicone epoxy
Vintage/Date Code: 1960s/1970s
Use: 2 Watt audio output/driver
Notes: Popular line of matched PNP/NPN power devices. Green is PNP, Red is NPN.

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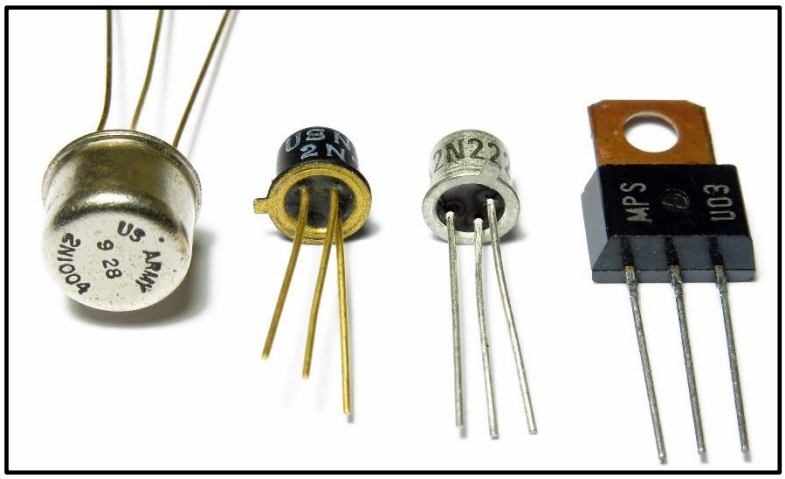

MOTOROLA VINTAGE SEMICONDUCTORS

2N1004 TRANSISTOR: The 2N1004 was initially developed for a 1956 US Army Signal Corps Production Engineering Measure (PEM) contract, and was one of the first higher speed "drift" transistor devices developed by Motorola. This type was likely never sold commercially, but instead was a "proof of concept" prototype.

USN 2N705 TRANSISTOR: Motorola invested heavily in the large scale production of germanium "mesa" transistor technology in the late 1950s/early 1960s. The first device types were the 2N695, 2N700 and 2N705. These were high performing devices and the 2N705 was qualified for military use as the USN 2N705.

2N2222 TRANSISTOR: The 2N2222 is one of a family of high performing, very successful transistors using a unique "STAR" technology introduced by Motorola in 1962. The "STAR" geometry uses an annular junction structure with epitaxial silicon layers to achieve high reliability, fast speed, and excellent performance.

MPSU03 TRANSISTOR: Motorola introduced this successful line of medium power devices in the late 1960s, building on the company's success with silicon transistors and plastic encapsulation. These transistors were originally envisioned as a "beefed up" TO-98 type, and competed well with the GE DXXX series.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Motorola 2N1004 transistor
Type: Germanium PNP drift
Case Color/Style: Silver metal TO-5
Vintage/Date Code: 1959
Use: 6 MC video amplifier
Notes: Developed for 1956 US Army Signal Corps PEM contract. 55+ year old device.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Motorola 2N2222 transistor
Type: Silicon NPN annular epitaxial "STAR"
Case Color/Style: Silver metal TO-18
Vintage/Date Code: 1960s/1970s
Use: High-speed switching and amplifier
Notes: One of the most popular transistor types ever developed. Still in use today.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Motorola USN 2N705 transistor
Type: Germanium PNP diffused junction
Case Color/Style: Black metal TO-18
Vintage/Date Code: 1960s
Use: Ultra high-speed switching
Notes: One of the first commercial mesa transistors. Qualified for US Navy use.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Motorola MPSU03 transistor
Type: Silicon NPN planar annular
Case Color/Style: Black plastic Uniwatt
Vintage/Date Code: 1960s/1970s
Use: Medium power amplifier, rated 1 Watt
Notes: Popular line of complementary PNP/NPN medium power amps - "Uniwatt".

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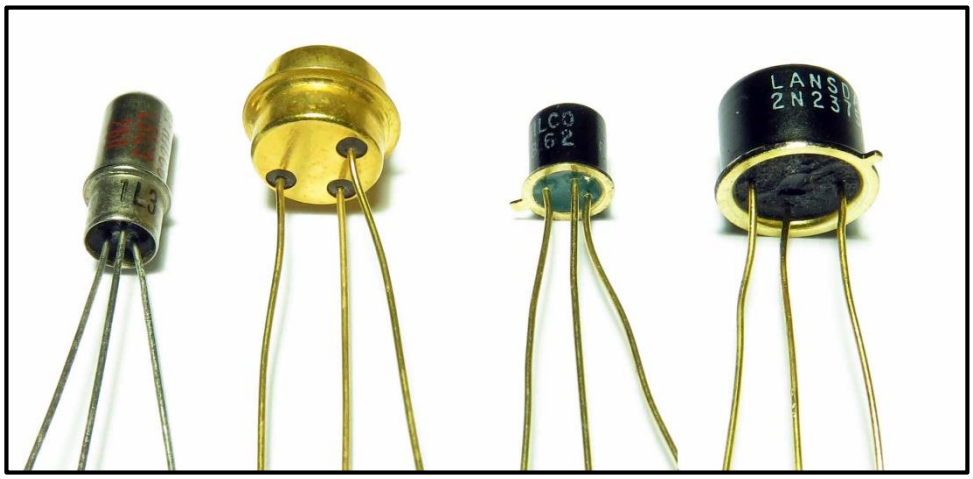

PHILCO HISTORIC SEMICONDUCTORS

L5129 TRANSISTOR: Philco's surface barrier transistor technology was the high frequency leader from late 1953 through the early 1960s and was used in many commercial and military applications such as radios and computers. The devices in this kit are early units, dated in the 1950s. "L" series units are preproduction types.

2N1500 TRANSISTOR: Philco continued to improve the surface barrier technology and developed the MADT technology in the mid to late 1950s. The 2N1500 MADT achieved switching speeds in excess of 20MC and was used in commercial digital computers. Philco developed and used the unique TO-9 case for many MADT types.

2N858-862 TRANSISTOR: Many germanium transistor companies (including Philco) struggled with the transition to silicon technology. The SPAT (silicon alloy) is an example of using the older germanium alloy process with silicon – it did not work well but is very interesting historically. Silicon alloy transistors were only available for a few short years from a few companies in the late 1950s/early 1960s and are rare.

2N2375 TRANSISTOR: Although best known for 1950s SBT/MADT transistors, Philco also produced small numbers of audio transistor types, beginning with the miniature 2N47 for hearing aids. The audio type in this kit was designed for industrial use and represents robust 1960s germanium audio transistor technology.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Philco L5129 transistor
Type: Germanium PNP surface barrier
Case Color/Style: Silver metal TO-24
Vintage/Date Code: 1950s
Use: Critical military applications/computer
Notes: Early version of 2N240. Philco SBT was first commercial high frequency type.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Philco 2N858-862 transistor
Type: Silicon PNP precision alloy
Case Color/Style: Black metal TO-18
Vintage/Date Code: Early 1960s
Use: High gain amplifier and switching
Notes: Historically interesting silicon alloy technology. Soon obsoleted by planar types.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Philco 2N1500 transistor
Type: Germanium PNP MADT
Case Color/Style: Gold metal TO-9
Vintage/Date Code: 1950s/1960s
Use: High speed switching/computer logic
Notes: MADT is Philco process for Micro Alloy Diffused-base to achieve high speed.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Philco 2N2375 transistor
Type: Germanium PNP alloy junction
Case Color/Style: Black metal TO-5
Vintage/Date Code: 1960s
Use: Medium power audio driver/output
Notes: Industrial grade audio amplifier for commercial products - radios/stereo amps.

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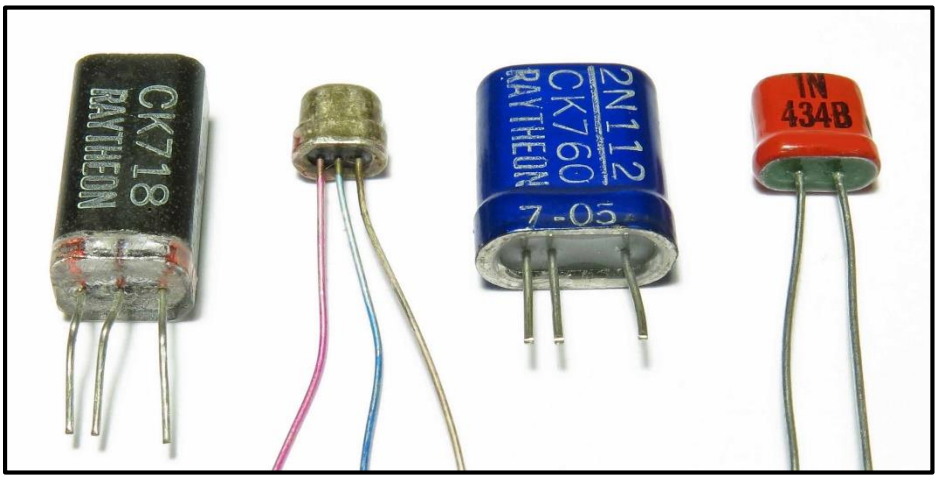

RAYTHEON HISTORIC SEMICONDUCTORS

CK718 TRANSISTOR: Raytheon was the first large scale manufacturer of commercial germanium transistors, beginning in 1952 with the famous CK718. Raytheon was the 1940s/50s leader in subminiature vacuum tube production designed for hearing aids, and moved quickly to protect this market with the CK718 during the transition from tubes to transistors. The CK718 was sold only to hearing aid manufacturers, such as Zenith.

CK78X TRANSISTOR: Hearing aid transistor technology evolved rapidly in the 1950s, to develop smaller and more reliable types. Improving on the CK718, Raytheon produced miniature metal-cased hearing aid transistors by 1955. Manufacturing "fallouts" were repackaged and sold to electronics hobbyists as the CK722.

RAYTHEON BLUE TRANSISTOR: Raytheon's brilliantly colored iridescent "Blue" germanium transistors from the mid-1950s are among the most recognizable devices from the early days of transistor history. Manufactured for only a few years, these alloy junction devices were used in radios and hearing aids.

1N434B DIODE: Although known primarily for germanium semiconductors, Raytheon also produced early silicon devices. The diode included in this kit was state-of-the-art in the late 1950s and sold for $6 in 1960, which is equivalent to approx $50 in 2014. Silicon devices were valued because of better high temperature performance.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Raytheon CK718 transistor
Type: Germanium PNP alloy junction
Case Color/Style: Black epoxy
Vintage/Date Code: 1952-1955
Use: Body style hearing aids
Notes: First transistor in volume production. 60+ year old historic device.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Raytheon "Blue" transistor
Type: Germanium PNP alloy junction
Case Color/Style: Blue metal
Vintage/Date Code: Mid 1950s
Use: Radios, hearing aids, hobbyist
Notes: Highly collectable, iridescent "Blue" color. Range of case sizes and shapes.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Raytheon CK78X transistor
Type: Germanium PNP alloy junction
Case Color/Style: Silver metal mini
Vintage/Date Code: Mid 1950s
Use: Hearing aids, hobbyist
Notes: Production test "fallouts" used as embedded device inside blue/silver CK722.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Raytheon 1N434B diode
Type: Silicon bonded junction
Case Color/Style: Red metal submini
Vintage/Date Code: 1958
Use: General purpose
Notes: Early example of silicon junction technology. 55+ year old device.

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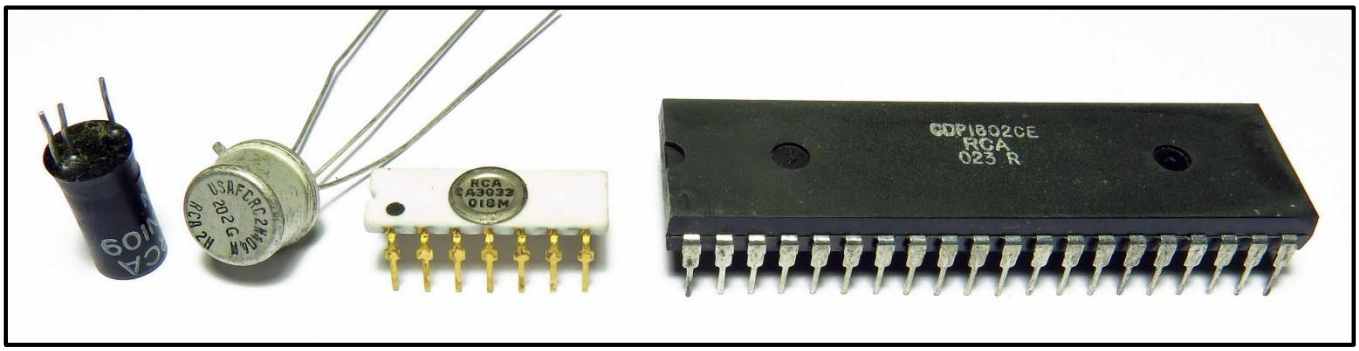

RCA HISTORIC SEMICONDUCTORS

2N109 TRANSISTOR: RCA was a very early manufacturer of germanium transistors, beginning in late 1953. The popular 2N109 was released in 1955 and saw widespread use for over a decade in a variety of products, including the Fisher TR-1, introduced in 1957 as the first "All-Transistor Hi-Fi" product.

USAF 2N404 TRANSISTOR: Introduced in 1957, the 2N404 was the first of a series of highly successful germanium computer transistors developed by RCA throughout the late 1950s. The devices in this kit are labeled "USAF", indicating rigorous testing to meet the requirements of military applications.

CD/CA SERIES IC: RCA was an early leader in CMOS IC technology, introducing the 4000 series of devices in the late 1960s. This technology was characterized by low power consumption and operability over a broad range of supply voltages. Digital logic circuits (CD) as well as analog types (CA) were developed by RCA.

1802 MICROPROCESSOR: The 1970s saw the introduction of the first microprocessor chips, including the RCA 1802 released in 1974. This device was used in a broad range of applications, including the COSMAC VIP hobby computer and the Galileo spacecraft which successfully reached Jupiter in 1995 after a 1989 launch. The 1802 is an example of early large scale integration IC technology, containing approx 2500 transistors.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: RCA 2N109 transistor
Type: Germanium PNP alloy junction
Case Color/Style: Black/silver metal TO-40
Vintage/Date Code: 1950s/1960s
Use: Large signal audio frequency amplifier
Notes: Used in many commercial devices such as preamps, radios and jukeboxes.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: RCA CD/CA 4000 series ICs
Type: CMOS digital (CD) and analog (CA)
Case Color/Style: White ceramic 14 pin DIP
Vintage/Date Code: 1960s/1970s
Use: Low power/rad hard general purpose
Notes: One of the 1st IC types available, developed by RCA in the mid 1960s.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: RCA 2N404 transistor
Type: Germanium PNP alloy junction
Case Color/Style: Silver metal TO-5
Vintage/Date Code: 1950s/1960s
Use: Computers/general purpose
Notes: Developed at RCA in 1957 for use in digital computers. Very successful device.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: RCA 1802 microprocessor
Type: CMOS large scale integration
Case Color/Style: Black ceramic 40 pin DIP
Vintage/Date Code: 1970s/1980s
Use: General purpose computing
Notes: Broad range of uses including home computers and Galileo spacecraft.

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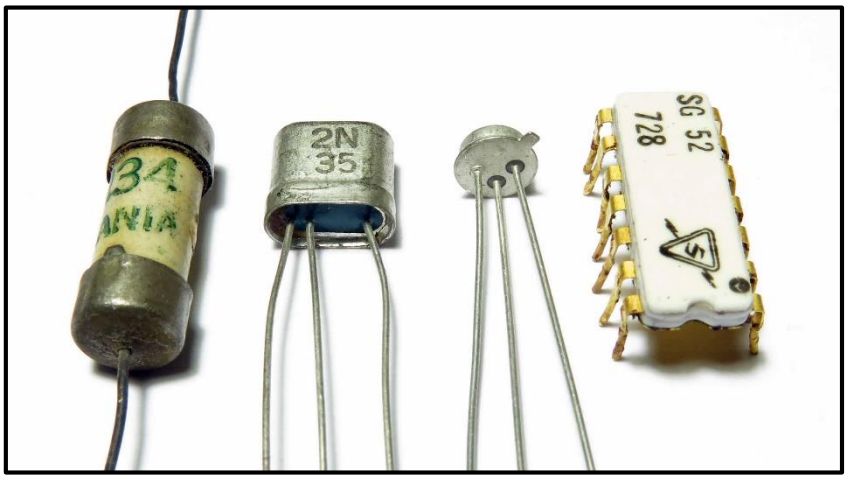


SYLVANIA HISTORIC SEMICONDUCTORS

1N34 DIODE: Introduced by Sylvania in 1946, the 1N34 germanium diode has been in commercial production ever since and continues to be the most popular and universally recognized diode available. A large cylindrical ceramic case with green lettering was the earliest version produced by Sylvania – later versions used a variety of glass case styles. Many companies over the past 65 years have sold versions of this unique device.

2N35 TRANSISTOR: The Sylvania 2N35 was one of the early transistors most commonly used by hobbyist/experimenters in the 1950s. Unlike most inexpensive transistors, the 2N35 was an NPN type, which made it ideally suited for circuits combined with the more common PNP types, such as the CK722 and 2N107.

2N708 TRANSISTOR: Sylvania participated in the 1950s/60s Micromodule program initiated by the Army Signal Corps to develop miniaturized components for use in military electronics hardware. The TO-46 "Pancake" style transistor case was one of the developments of this effort, and was used for various transistor types.

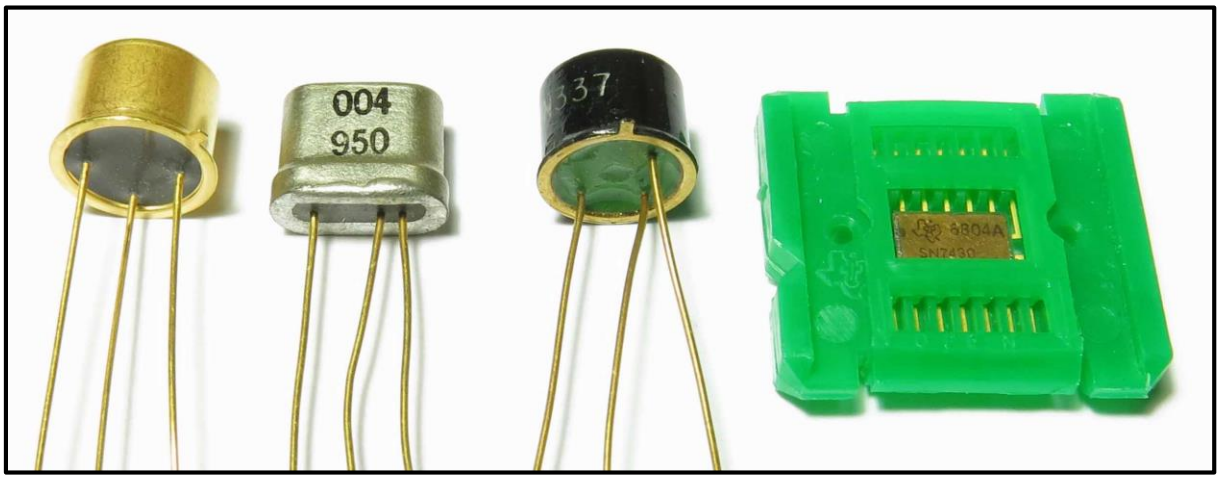
SG52 IC: The first ICs were commercialized in the early 1960s, by pioneering companies such as TI and Fairchild. In 1963 Sylvania introduced an early and high performance version of IC TTL technology called SUHL (Sylvania Universal High-Level Logic). These devices implemented basic digital logic functions.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Sylvania 1N34 diode
Type: Germanium point-contact
Case Color/Style: White ceramic cartridge
Vintage/Date Code: 1940s/1950s
Use: General purpose diode/radio detector
Notes: Released in 1946 by Sylvania, this is the first commercial germanium diode.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Sylvania 2N708 transistor
Type: Silicon NPN epitaxial planar
Case Color/Style: Silver metal TO-46
Vintage/Date Code: 1960s
Use: High speed switch
Notes: Unique TO-46 "Pancake" case style developed for Signal Corps Micromodules.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Sylvania 2N35 transistor
Type: Germanium NPN alloy junction
Case Color/Style: Silver metal TO-22
Vintage/Date Code: 1950s/1960s
Use: General purpose/audio amplifier
Notes: One of the first widely available NPN transistors. Popular with 1950s hobbyists.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Sylvania SG 52 SUHL
Type: Silicon TTL Integrated Circuit
Case Color/Style: White glass plug-in
Vintage/Date Code: 1960s
Use: Quad 2-Input OR Gate digital logic
Notes: One of the first TTL product lines. 45+ year old historic IC device.



TEXAS INSTRUMENTS HISTORIC SEMICONDUCTORS

R212 TRANSISTOR: In 1956, the Navy began funding Polaris, a large scale project to develop a ballistic missile that could be launched from a submerged submarine. The first version of the Polaris guidance computer used discrete transistors, including the very high quality R212. TI was a major 1960s/70s supplier of the R212.
TYPE 950 TRANSISTOR: TI made semiconductor history with the 1954 introduction of the 900 series of devices, which were the industry's first commercial silicon transistors. Different TI 9XX transistor types sold for high prices and in large quantities throughout the 1950s/60s and established TI as an industry leader.
2N337 TRANSISTOR: TI refined the 900 series of transistor types, including the use of industry standard case types, such as TO-5. For example, the resulting 2N332-338 line of transistors were used in large quantities for industry and military applications, including the early U.S. satellites "Vanguard" and "Explorer".
SN7430F IC: Only 12 years after the 1948 announcement of the invention of the transistor, commercial integrated circuit technology became available from TI ("Solid Circuit") and Fairchild ("Micrologic"). These historic first ICs implemented multiple transistors and related components and performed basic logic functions. Building on this groundbreaking technology, the 1960s/70s saw phenomenal progress leading to large scale ICs.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: TI R212 transistor
Type: Germanium PNP alloy junction
Case Color/Style: Gold metal TO-5
Vintage/Date Code: 1960s/1970s
Use: Polaris missile guidance computer
Notes: Military quality device, developed to meet Navy specs for Polaris missile.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: TI 2N337 transistor
Type: Silicon NPN grown diffused
Case Color/Style: Black metal TO-5
Vintage/Date Code: 1959
Use: 10 mc switching and general purpose
Notes: TI 2N33X series of rugged silicon transistors used in early U.S. satellites.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: TI 950 transistor
Type: Silicon NPN grown junction
Case Color/Style: Silver metal TO-22
Vintage/Date Code: 1960 week 4
Use: Medium power amplifier
Notes: Early example of silicon transistor technology. 50+ year old historic device.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: TI SN7430F Solid Circuit
Type: Silicon TTL Integrated Circuit
Case Color/Style: Gold metal flat pack
Vintage/Date Code: 1968 week 4
Use: 8-input Positive NAND Gate
Notes: Early example of TTL integrated circuit. 45+ year old historic IC device.

TRANSITRON HISTORIC SEMICONDUCTORS

2N343 TRANSISTOR: TI introduced the 2N339/2N343 line of medium power silicon grown junction transistors in 1957. Transitron was the major second source supplier for this transistor type, and sold large numbers of units into the 1960s to industry and the military at high prices – over $200 each in 2014 prices.
EMBOSSED TRANSISTOR: Early transistor case styles were not always standardized and several companies used some form of embossing or other unique method of "brand advertising" with the case design. Of note are Transitron with an embossed "T" and Fairchild with an embossed stylized "F". These are rare and collectable.
2N2905 TRANSISTOR: Transitron soon followed the lead of TI in manufacturing silicon transistors, and introduced commercial devices in 1957/58. These first silicon transistors were made using the grown function process. By the mid-1960s, the planar technology developed by Fairchild was implemented by most companies.
S775G-1 DIODE: Founded in 1952, Transitron became one of the largest and most successful semiconductor companies by the late 1950s. An important technology manufactured by Transitron was the germanium gold bonded diode, which offered advantages such as high reliability and performance. This device type was an important product for Transitron and sold in volume to the military, including the Minuteman missile program.

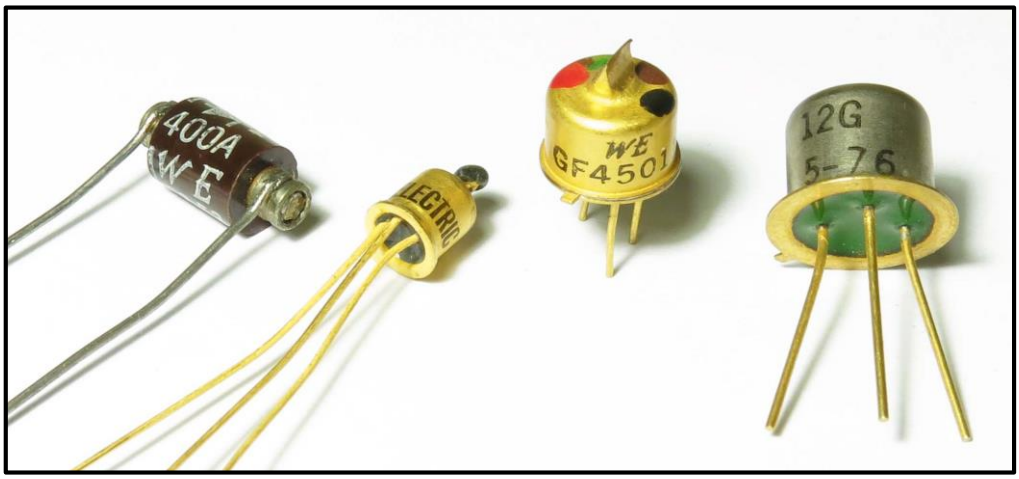
TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Transitron 2N343 transistor
Type: Silicon NPN grown junction
Case Color/Style: Black metal welded seal
Vintage/Date Code: Early 1960s
Use: One watt medium power/gen purpose
Notes: Expensive early silicon power type, used by the U.S. military in large quantities.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Transitron 2N2905 transistor
Type: Silicon PNP planar
Case Color/Style: Silver metal TO-5
Vintage/Date Code: 1960s
Use: General purpose
Notes: An excellent example of early planar technology. This is a 40+ year old device.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Transitron Embossed transistor
Type: Silicon NPN grown junction
Case Color/Style: Gold/silver metal TO-5
Vintage/Date Code: Early 1960s
Use: General purpose
Notes: Highly collectable and rare series with stylized "T" embossed on case top.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: Transitron S775G-1 diode
Type: Germanium gold bonded
Case Color/Style: Blue banded glass DO-7
Vintage/Date Code: 1960s
Use: High reliability switching
Notes: Qualified for 1963 Autonetics order for Air Force Minuteman missile program.

TRANSISTOR MUSEUM™
HISTORIC SEMICONDUCTORS RESEARCH AND COLLECTING KIT



WESTERN ELECTRIC HISTORIC SEMICONDUCTORS

TYPE 400A/1N43 DIODE: Beginning in the late 1940s, Western Electric manufactured germanium point contact diodes for use in Bell System telephone equipment. Model numbers 400A through 400J were used to indicate specific voltage and current capabilities. The 400A in this kit is also labeled 1N43.

2N559 TRANSISTOR: Beginning in the late 1950s, the 2N559 was manufactured in large quantities at the Western Electric facility in Laureldale, PA for use in the Nike Zeus anti-missile missile defense program. This transistor type was selected because the diffused junction technology was the best available at the time. The devices in this kit are marked and unmarked high quality gold-plated units produced in the early 1960s.

GF45011 TRANSISTOR: The diffusion process for germanium and silicon transistor production was developed at Bell Labs in the mid-1950s. This was the only technology available to meet the requirements for the telemetry transmitters in the first U.S. satellites in the late 1950s, including both Explorer and Vanguard.

TYPE 12 TRANSISTOR: Western Electric manufactured the transistors used in Bell System telephone equipment, and the Type 12 was used for decades as a basic, rugged audio amplifier and medium speed switch. Models numbers 12A through 12N were used to indicate specific gain, voltage and frequency capabilities.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: WE Type 400A/1N43 diode
Type: Germanium point-contact
Case Color/Style: Brown phenolic axial
Vintage/Date Code: 1940s/1950s/1960s
Use: General purpose diode/radio detector
Notes: Rugged "workhorse" diode for the Bell System. Based on 1940s design.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: WE GF45011 transistor
Type: Germanium PNP diffused junction
Case Color/Style: Gold or black pinch-top
Vintage/Date Code: 1950s/1960s
Use: VHF amplifier/oscillator/driver
Notes: Historic device. Selected for use as solar powered xmitter in Vanguard 1 satellite.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: WE 2N559 transistor
Type: Germanium PNP diffused junction
Case Color/Style: Gold miniature pinch-top
Vintage/Date Code: 1950s/1960s
Use: Low power ultra high speed switching
Notes: Historic device. Selected for use in Nike Zeus anti-missile defense system.

TRANSISTOR MUSEUM
Historic Semiconductor Data
Device ID: WE Type 12 transistor
Type: Germanium PNP alloy junction
Case Color/Style: Gold or silver metal
Vintage/Date Code: 1950s/1960s/1970s
Use: 1/4 watt general purpose/audio amp
Notes: Rugged "workhorse" transistor for Bell System. Various case styles over 25 yrs.

10 ADDITIONAL SELECTED HISTORIC SEMICONDUCTORS

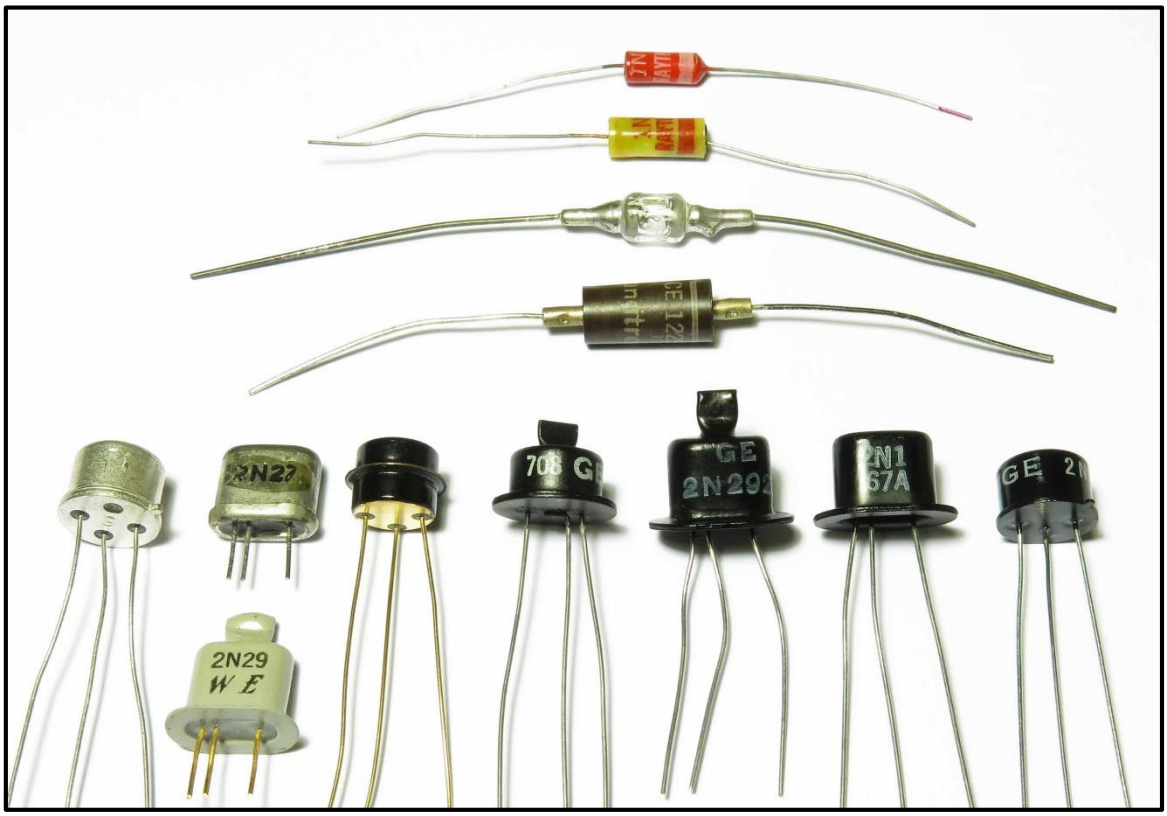
In addition to the 40 semiconductors which have been documented with photographs and commentary in the preceding pages, this Transistor Museum **Historic Semiconductors Research and Collecting Kit** also contains 10 additional 1950s/1960s/1970s historic semiconductors which have been included to:

- **Expand the initial research collection of 40 devices:** All additional 10 devices are clearly identified by manufacturer name and device id. Also included are storage envelopes and data cards.

- **Encourage the researcher/collector to begin using suggested research tools:** The researcher/collector will be able to use the research tools (web sites and publications) listed in the reference section of this kit, as the first step in learning more about semiconductor history. The data cards supplied with the 10 additional semiconductors require research in order to complete all the information fields with newly learned facts about the devices.

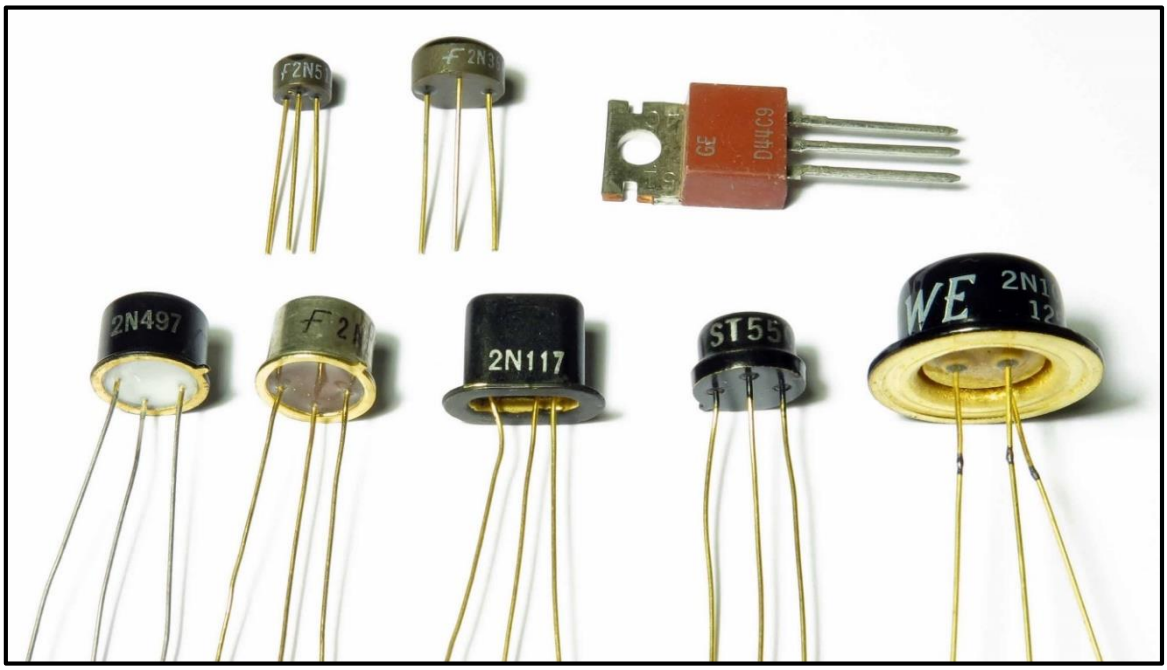
- **Provide a broader range of device types:** The Transistor Museum has been researching and collecting historic semiconductors for many years, and the additional 10 devices will be selected from a broad range of unique and historically important semiconductors. No two kits will be the same, because the additional 10 devices are hand-selected for each kit.

The next three pages contain photographs of the types of devices that will be included in the additional collection of 10 semiconductors. Remember, each collection of 10 will be unique and hand-selected. The photographs are provided to illustrate the range and types of devices that will be included, and not specific devices.



HISTORIC 1950s/1960s GERMANIUM DIODES AND TRANSISTORS

Shown at top are four 1950s germanium point contact diodes, from Raytheon, Sylvania and Transitron. The row of transistors well illustrate the interesting range of case styles, colors and manufacturers of germanium transistors from the 1950s/1960s. These transistors also represent the range of germanium transistor technologies from this early period, including PNP, NPN, alloy junction, MADT and grown junction. The transistor manufacturers represented above include RCA, Western Electric, Philco and GE. The actual devices included in the kit will be similar to those shown above, and will represent the important technologies and types from the 1950s/1960s.



HISTORIC 1960s/1970s SILICON TRANSISTORS

Shown above are transistors that well illustrate the interesting range of case styles, colors and manufacturers of silicon transistors from the 1960s/1970s. The transistor manufacturers represented include Fairchild, GE, Texas Instruments, Transitron and Western Electric. These transistors also represent the range of silicon transistor technologies from this early period, including PNP, NPN, planar, mesa, double diffused and grown junction. The actual devices included in the kit will be similar to those shown above, and will represent the important technologies and types from the 1960s/1970s.

HISTORIC 1950s/1960s/1970s COMMERCIAL SEMICONDUCTOR PACKAGING

An interesting aspect of researching and collecting early semiconductors is the great variety of colors, graphics and presentation styles of the packaging developed for these devices. Using techniques similar to those developed decades earlier for commercial vacuum tubes, semiconductor manufacturers of the 1950s/1960s/1970s often sold individual devices in ornate, artistic and costly packages. These early semiconductors were relatively expensive, so it is likely that the manufacturers decided to emphasize brand recognition and customer acceptance with well-designed and visually compelling packages. Shown above are examples of semiconductor packaging styles from the 1950s/1960s/1970s. The additional collection of 10 semiconductors included in this kit will contain at least two historic semiconductors in original packaging, similar to the types shown above.

NEXT STEPS – INTERESTING THINGS TO DO

This Transistor Museum **Historic Semiconductors Research and Collecting Kit** is unique in the world of historic semiconductor research and has been developed to provide an enjoyable learning experience and an unparalleled opportunity to begin and then expand your collection. Below are suggested next steps for the researcher/collector:

Expand the Collection – This kit includes additional storage and presentation envelopes and data cards to expand the initial collection of 50 devices. An excellent next step would be to research, locate and acquire examples of different historically interesting types of early devices.

Research the Devices from a Specific Company or a Model Number Range – After you've started the initial collection of early semiconductor types, consider expanding the collection with emphasis on a particular historic company of interest or a specific number range of devices. For example, the earliest transistors were labeled with the 2NXX numbering system, such as 2N35, and a suggested research strategy might be to identify and collect the complete range of known devices from 2N21 to 2N99. Another approach might be to collect the complete range of known "2N" types from a specific semiconductor company such as General Electric or TI.

Research the Packaging Styles from a Specific Company – As noted earlier, historic semiconductor packaging styles are often visually compelling and can be the basis for substantial research. For example, the packaging styles used by many important semiconductor companies evolved over the decades, so a suggested research/collecting approach would be to focus on the packaging changes from the 1950s to the 1970s for each company of interest.

Research Specific Technologies – For example, only a few companies manufactured tunnel diodes commercially. A very interesting research/collecting program would be to identify and collect examples of tunnel diodes from all the companies that actually produced these devices. Other examples of unique semiconductor technology that could be researched and collected in this manner are (1) unijunction transistors (2) point contact transistors and (3) FET transistors.

Include Devices from Additional Companies – This initial kit includes historic semiconductors from ten specific companies that were well known manufacturers in the 1950s/1960s/1970s. Many other companies also made important contributions to semiconductor technology and researching/collecting devices from these companies is another excellent approach for expanding the kit.

Check Back Often at the Transistor Museum - The Transistor Museum website will continue to make available research information, photographs, oral histories, historic semiconductors, data cards and storage/display envelopes to assist researchers and collectors. We are committed to supporting those with an interest in this unique and fascinating subject.

The remainder of this book contains the following material to aid in researching and collecting historic semiconductors:

- **A Brief History of Early Semiconductors:** This unique history is based on Transistor Museum research material, with photographs and historical commentary, which should be invaluable to researchers/collectors. This 25+ page presentation provides technical and corporate information on all ten companies associated with the devices in this kit. Highly readable and informative. This history is documented starting with the first cat whisker patents in the early 1900s through the first microprocessor ICs in the 1970s.

- **Bibliography of Historic Semiconductor Research Material:** The references provided in this section include web links and documentation will be an important asset in researching and collecting historic semiconductors. The Transistor Museum has devoted years to developing this list and often uses the referenced material while conducting ongoing Museum research.

Use this Link for the Brief History of Early Semiconductors and the Bibliography