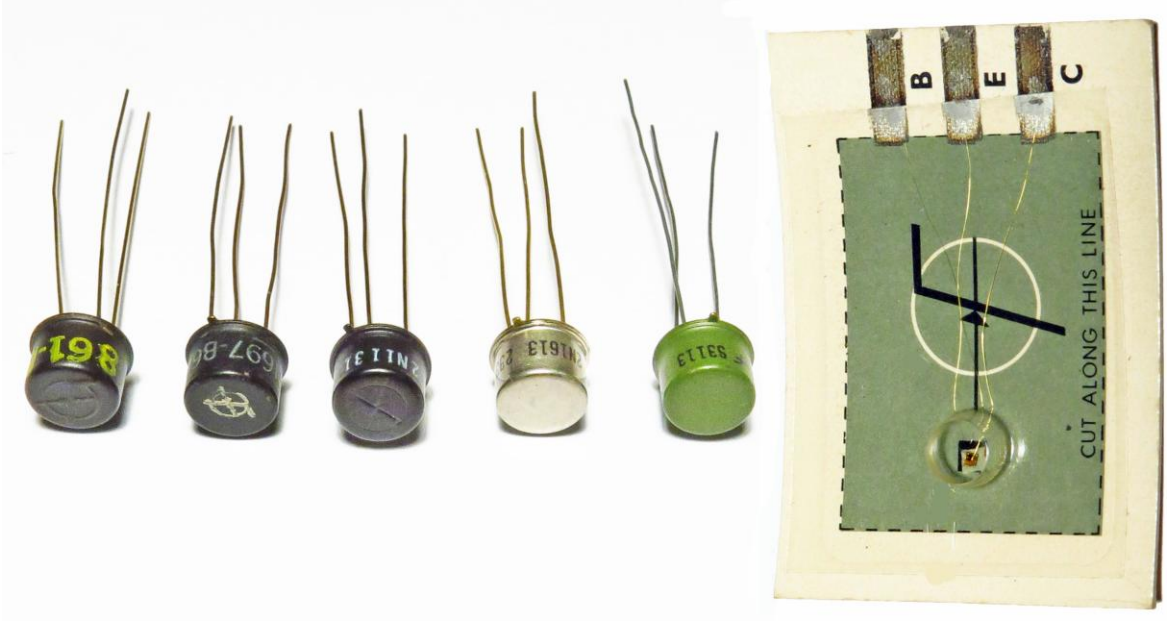
TRANSISTOR MUSEUM™

HISTORY OF TRANSISTORS PRESERVATION COLLECTION

FAIRCHILD TRANSISTORS THE FIRST TEN YEARS

Special Collection of Historic 1950s/60s Fairchild Silicon Transistors

"The First Transistors in Silicon Valley"



INCLUDED ARE ORIGINAL 60+ YEAR-OLD EXAMPLES OF THE LEGENDARY FAIRCHILD TRANSISTOR TYPES SHOWN ABOVE. THESE ARE TRULY HISTORIC DEVICES AND REPRESENT THE FIRST TRANSISTORS MANUFACTURED IN SILICON VALLEY. ALSO INCLUDED ARE PHOTOS, TECHNICAL DESCRIPTIONS AND RESEARCH LINKS.

A Transistor Museum Preservation Collection

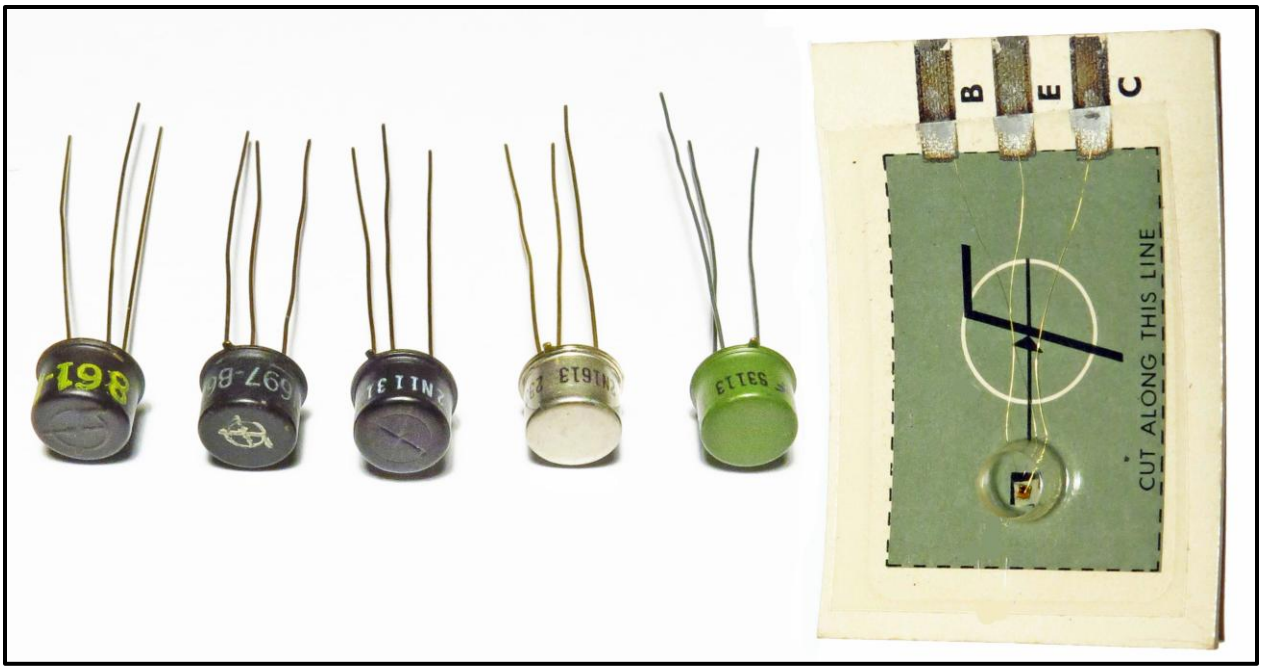
ABOUT THIS TRANSISTOR MUSEUM PRESERVATION COLLECTION

Established in the late 1990s, the Transistor Museum has been an important online resource for documenting the history of the transistor. The Museum receives many thousands of web site visits each year from those who are interested in learning about the early days of transistor technology. The Museum has recently established the "Preservation Collection" program with the goal of actively preserving transistor history by making available truly historic transistor types, including display packaging and comprehensive documentation, for those who wish to further explore "The Greatest Invention of the 20th Century". ***Fairchild Transistors – The First Ten Years*** is one of a series of ongoing History of Transistors Preservation Collections developed by the Transistor Museum™. This volume documents the first transistors to be developed in Silicon Valley, starting in the 1950s/60s by the newly established Fairchild Semiconductor Corp. Much has been written about the famous technological and business exploits of Fairchild which was founded in 1957 by the "traitorous Eight" engineers who left Shockley Semiconductor Labs to start the legendary first transistor company in Silicon Valley. In addition to the six very historic Fairchild transistors as noted below, this preservation collection also includes extensive links to important online documentation, technical and historical commentary, circuits, and photographs of the famous Fairchild silicon transistors that first appeared in the 1950s/60s and launched modern silicon electronics and Silicon Valley.

SIX TRANSISTORS INCLUDED IN THIS PRESERVATION COLLECTION

TRANSISTOR TYPE	HISTORICAL SIGNIFICANCE
FAIRCHILD "861" MILITARY	Early Fairchild 1959 NPN silicon mesa transistor selected to meet the high reliability requirements of the U.S. Air Force Minuteman program.
FAIRCHILD 2N696/697	First Fairchild commercial transistor type. Introduced in 1958 this NPN silicon mesa device was the best performing and most reliable type available and established Fairchild as the technology leader in silicon.
FAIRCHILD 2N1131/1132	The second Fairchild commercial transistor type. Introduced in 1959 this PNP silicon mesa device was the circuit complement to the NPN 2N696/697 type and enhanced Fairchild's leadership position.
FAIRCHILD 2N1613	The first "modern" transistor. Introduced in 1959, the 2N1613 was the first commercial device using Fairchild's revolutionary "planar" technology which soon became the industry standard for semiconductors and was the basis for commercial integrated circuits.
FAIRCHILD "S" TYPE	Fairchild "S" type transistors were developed to meet special customer requested requirements – usually identified with an "S" part number and a unique "Fairchild green" case color.
FAIRCHILD "VISIBLE T"	This unique early 1960s Fairchild type with visible transistor junctions in a plastic bubble/paper case is an evaluation type used by the Fairchild sales team to provide to customers for circuit testing and evaluation.
TOTAL HISTORIC TRANSISTORS INCLUDED = 6	

HISTORY OF TRANSISTORS PRESERVATION COLLECTION
FAIRCHILD TRANSISTORS - THE FIRST TEN YEARS
First Edition December 2024



What's Included In This Fairchild Transistors First Ten Years Historic Preservation Collection

This Preservation Collection includes six historic 1950s/60s Fairchild silicon transistors. You'll receive six original Fairchild transistors of the types shown above, each of which reflects a unique aspect of these first transistors from Silicon Valley. These types shown above capture the various technologies, case styles, numbering and evolution of the early Fairchild transistor product types. At above left is a very rare example of the high reliability types supplied by Fairchild to the Autonetics/Minuteman program. This program was an important early customer for Fairchild and was key in establishing the new Fairchild silicon mesa transistor type as "best on the market". The transistor in this collection is dated 1959 and is stamped as Minuteman part "861". This is an NPN silicon mesa type, likely tested and selected from the first Fairchild 2N696/697 production runs. Second from left is the famous 2N696/697 first Fairchild standard production type. This is an NPN silicon mesa type and the 1958 introduction marked Fairchild's very successful entry into the commercial market. The 2N696/697 transistors in this collection are dated 1959/1960. At center is the first PNP transistor type from Fairchild – this 2N1131/1132 type was introduced in 1959 as a circuit complement to the 2N696/697. The transistor in this collection is dated 1962. Third from right is the legendary 2N1613 first "planar" transistor. Fairchild's 1959 introduction of this device revolutionized semiconductor technology. The unit in this collection is dated 1962. The olive green colored transistor above is an example of a Fairchild early 1960s "customer special" transistor. Remaining examples of this type are very rare. At far right is a another very rare early 1960s Fairchild type – the "Visible Transistor" which was presented to potential customers for circuit evaluation. Truly unique. Note: All transistors in this collection are dated from the 1950s/early-mid 1960s. Also note that although not consistently used, many early Fairchild transistors from this timeframe carry the unique stamped "Flying F" emblem on the top of the case - the left three devices illustrate this. The six Fairchild transistors contained in this collection are truly historic, very rare and represent the first transistor types ever manufactured in Silicon Valley.

The "Traitorous Eight" Leave Shockley and Start Fairchild Semiconductor Corporation

Above is the iconic photo of the eight engineers/scientists who resigned from Shockley Semiconductor as a group in 1957 to form Fairchild Semiconductor.

Gordon Moore (from left to right), C. Sheldon Roberts, Eugene Kleiner, Robert Noyce, Victor Grinich, Julius Blank, Jean Hoerni and Jay Last.

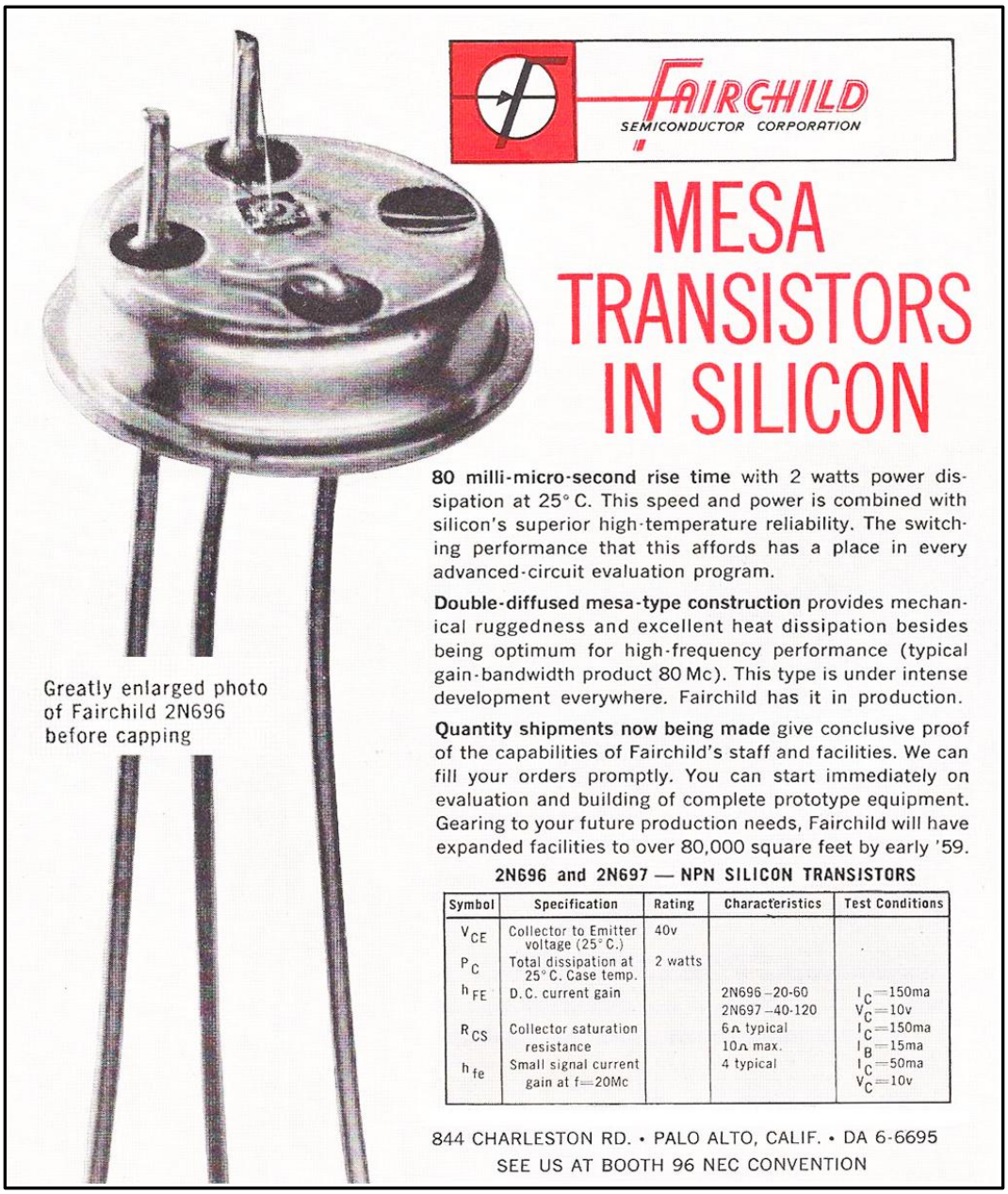
Photo Credit: California Historical Society/Wayne Miller/Magnum Photo

Colorized Image – Courtesy Transistor Museum

Note that the Fairchild transistors included in this Preservation Collection are from these early Fairchild years; also note the stylized "Flying F" symbol on the brick wall in the photo. This same corporate symbol was stamped on early Fairchild transistors, including several in this Preservation Collection. The events leading to the 1957 founding of Fairchild and the remarkable subsequent impact on the beginnings of Silicon Valley and the entire semiconductor industry makes for a very interesting historical saga. Much research and many articles on this topic have been published or made available on-line. For further reading, the Transistor Museum highly recommends the following two resources:

David Laws – Computer History Museum Semiconductor Curator

Michael Riordan/Lillian Hoddeson – *Crystal Fire*



The First Silicon Transistors in Silicon Valley

Shown above is an ad in the May 22, 1959 Electronics industry magazine indicating that quantity shipments were now available for the new NPN 2N696/697 silicon mesa transistors, stating that this should "give conclusive proof of the capabilities of Fairchild's staff and facilities". Not bad for a company that had just been formed and that was developing new technologies from the ground up. Fairchild had formally announced these transistors just a year earlier at the 1958 Wescon show and clearly was making progress. Note that the 2N696/697 were identical except that the 2N697 had higher gain.

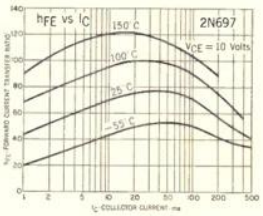
The First Silicon in Silicon Valley

The IEEE Milestone: Birthplace of Silicon Valley, 1956 includes the following citation: ***At this location, 391 San Antonio Road, the Shockley Semiconductor Laboratory manufactured the first silicon devices in what became known as Silicon Valley. Some of the talented scientists and engineers initially employed there left to found their own companies, leading to the birth of the silicon electronics industry in the region. Hundreds of firms in electronics and computing can trace their origins back to Shockley Semiconductor.*** The original Shockley building at this location has been replaced by a modern business complex – however, in honor of the historical significance of the site, the developers worked with local artists to create three very large metal sculptures of the first silicon device types to be manufactured in Silicon Valley. The photo above left provides a view of these devices – the Fairchild 2N696 silicon transistor shown in front, and two versions of the Shockley 4-Layer diode shown in the distance (courtesy Steve Leibson). Shown above center is a front view of one of the two Shockley diode sculptures. Shockley Semiconductor Labs began growing silicon crystals in 1956 and fabricated 4-layer PNPN Shockley diodes over the next three years until announcing the commercial availability of the Shockley diode at the 1960 Wescon. The photo above right shows one of these historic first Shockley diodes. Fairchild Semiconductor (formed by the "Traitorous Eight" Shockley group) began growing silicon crystals in 1957 and announced their first silicon transistors at the 1958 Wescon show. Between these two historic companies can be found (1) The birthplace of Silicon Valley (2) The first silicon devices produced in Silicon Valley and (3) The first silicon transistors produced in Silicon Valley. Quite excellent accounts of these historic events are here: Michael Riordan/Lillian Hoddeson – *Crystal Fire* and here: https://www.computerhistory.org/revolution/digital-logic/12/275.

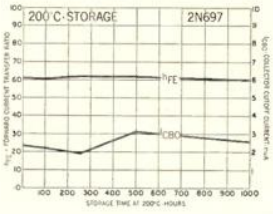
DIFFUSED SILICON TRANSISTORS

A report on mesa transistors at Fairchild

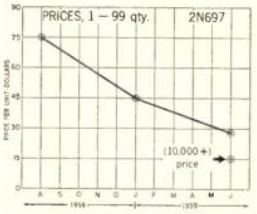
What do they mean to the circuit designer working on next year's transistorized equipment? The superior speed-power combination attainable with this new type of transistor has caused virtually every semiconductor manufacturer to give them top R & D priority. Meanwhile Fairchild has been producing diffused silicon transistors in quantity for over a year and can answer the important questions.



Are they replacing existing types? Some customers have replaced four to five types with one Fairchild type. This is readily possible because the diffused silicon transistor retains its high performance characteristics over a wide spread of collector current and operating frequency. Graph shows, for example, the range of useful current gain in the Fairchild 2N697. A few such diffused silicon devices could cover the entire range served by present transistors, and complementary NPN and PNP devices are feasible.



Are they reliable? Reliability is one of their top advantages. A 60-hour pre-aging of all units at 300° C accomplishes a stabilization equal to thousands of operating hours at 200° C. At the 200° C temperature, parameters are relatively unaffected by extended storage as shown on the graph. Also, mesa construction eliminates suspended masses, hence Fairchild units have survived mechanical shocks as high as 20,000 g. Customers' tests have consistently proven these transistors more reliable than any other type.



Are they economically practical? Prices were reduced by over 60% in just nine months after they were first introduced, making them competitive with lower performance units of other types. But most important for the future: the diffusion process is inherently controllable, hence well suited to automated production. The result: far better and more versatile devices at a price equal to or lower than prices on today's predominant types of transistors.

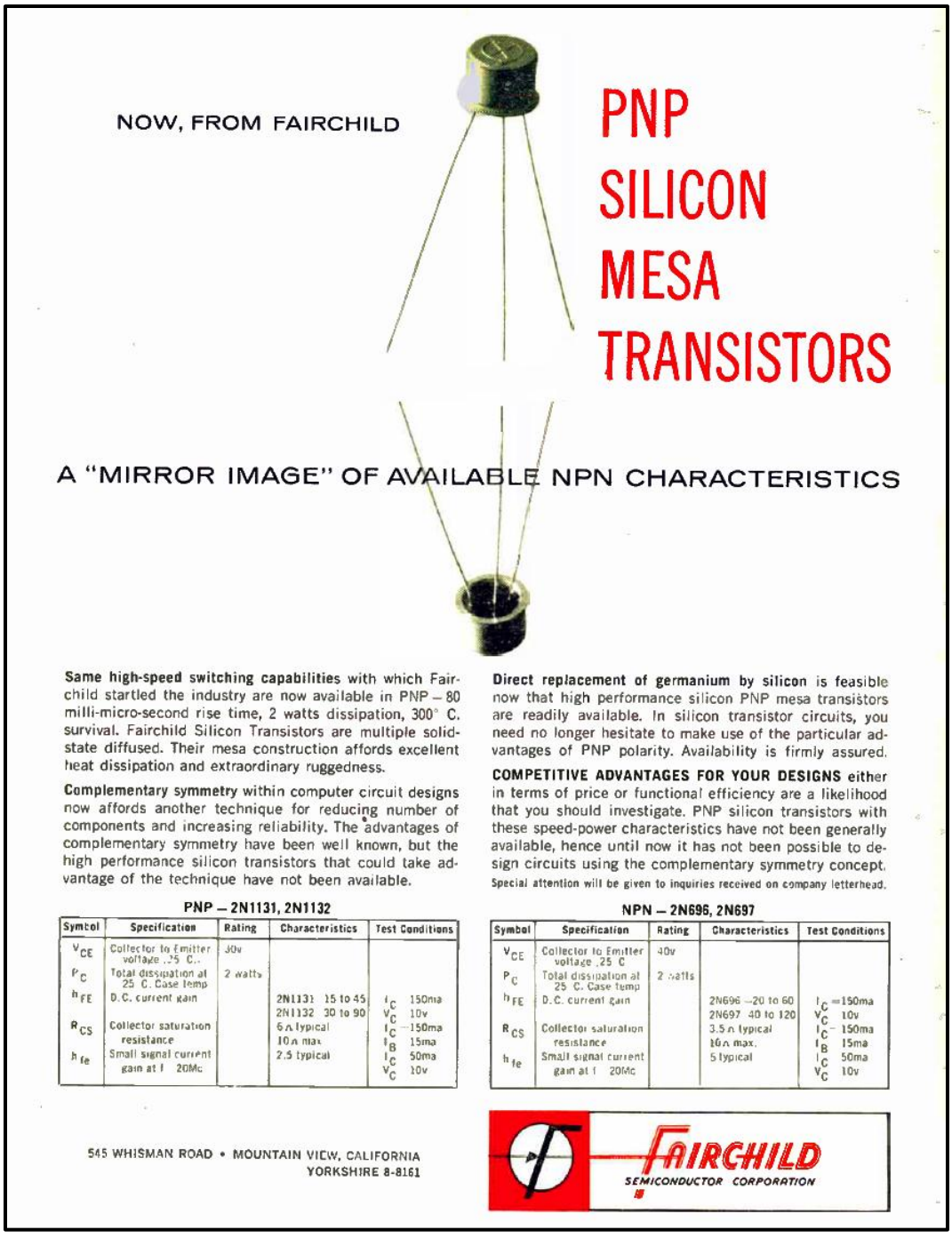
Are they being accepted by users? In less than one year after announcing the diffused silicon mesa transistor, Fairchild opened a new manufacturing plant approximately six times larger than the company's original facility. This was in response to demand. And already additional expansion is being planned.

May we keep you up to date on further developments? Write Dept. A-10-23

FAIRCHILD
SEMICONDUCTOR CORPORATION

The First Fairchild Transistors are in Demand

Shown above is a Oct 29, 1959 Fairchild summary status report highlighting the very positive acceptance for the 2N696/697 silicon mesa transistors by the electronics industry. Key positives for these transistors are reliability, economy and broad replacement possibilities for current existing types. Quite a remarkable introduction for this new silicon technology by this newly formed company.



NOW, FROM FAIRCHILD

PNP SILICON MESA TRANSISTORS

A "MIRROR IMAGE" OF AVAILABLE NPN CHARACTERISTICS

Same high-speed switching capabilities with which Fairchild startled the industry are now available in PNP – 80 milli-micro-second rise time, 2 watts dissipation, 300° C. survival. Fairchild Silicon Transistors are multiple solid-state diffused. Their mesa construction affords excellent heat dissipation and extraordinary ruggedness.

Complementary symmetry within computer circuit designs now affords another technique for reducing number of components and increasing reliability. The advantages of complementary symmetry have been well known, but the high performance silicon transistors that could take advantage of the technique have not been available.

Direct replacement of germanium by silicon is feasible now that high performance silicon PNP mesa transistors are readily available. In silicon transistor circuits, you need no longer hesitate to make use of the particular advantages of PNP polarity. Availability is firmly assured.

COMPETITIVE ADVANTAGES FOR YOUR DESIGNS either in terms of price or functional efficiency are a likelihood that you should investigate. PNP silicon transistors with these speed-power characteristics have not been generally available, hence until now it has not been possible to design circuits using the complementary symmetry concept.

Special attention will be given to inquiries received on company letterhead.

PNP – 2N1131, 2N1132

Symbol	Specification	Rating	Characteristics	Test Conditions
V_{CE}	Collector to Emitter voltage, 25 C.	30v		
P_C	Total dissipation at 25 C. Case temp	2 watts		
h_{FE}	D.C. current gain		2N1131 15 to 45 2N1132 30 to 90	I_C 150ma V_C 10v
R_{CS}	Collector saturation resistance		6 Ω typical 10 Ω max	I_C 150ma I_B 15ma
h_{fe}	Small signal current gain at f 20Mc		2.5 typical	I_C 50ma V_C 10v

NPN – 2N695, 2N697

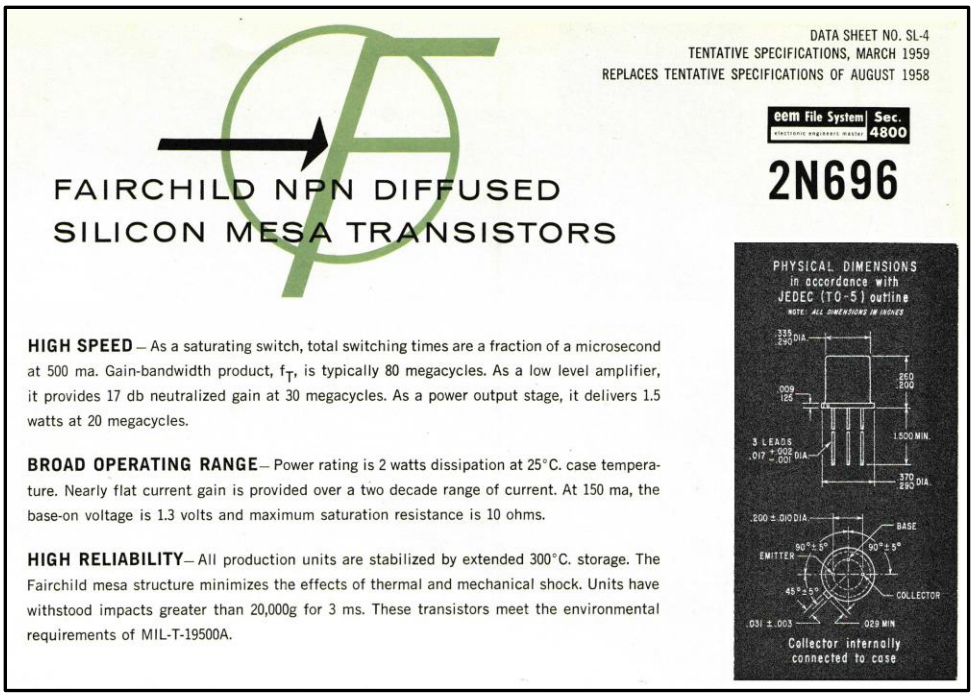
Symbol	Specification	Rating	Characteristics	Test Conditions
V_{CE}	Collector to Emitter voltage, 25 C	40v		
P_C	Total dissipation at 25 C. Case temp	2 watts		
h_{FE}	D.C. current gain		2N696 20 to 60 2N697 40 to 120	I_C 150ma V_C 10v
R_{CS}	Collector saturation resistance		3.5 Ω typical 10 Ω max.	I_C 150ma I_B 15ma
h_{fe}	Small signal current gain at f 20Mc		5 typical	I_C 50ma V_C 10v

545 WHISMAN ROAD • MOUNTAIN VIEW, CALIFORNIA
YORKSHIRE 8-8161

FAIRCHILD SEMICONDUCTOR CORPORATION

First NPN – Then PNP Silicon Mesa from Fairchild

Shown above is an ad in the Sept 25, 1959 Electronics industry magazine indicating that the 2N1131/1132 PNP "Mirror Image" versions of the original NPN 2N696/697 were now available. This NPN/PNP complementary symmetry provided for better computer circuit designs and substantially enhanced the use of Fairchild transistors in multiple applications. Note that the 2N1131/1132 were identical except that the 2N1132 had higher gain.



DATA SHEET NO. SL-4
TENTATIVE SPECIFICATIONS, MARCH 1959
REPLACES TENTATIVE SPECIFICATIONS OF AUGUST 1958

eem File System Sec. 4800

FAIRCHILD NPN DIFFUSED
SILICON MESA TRANSISTORS

2N696

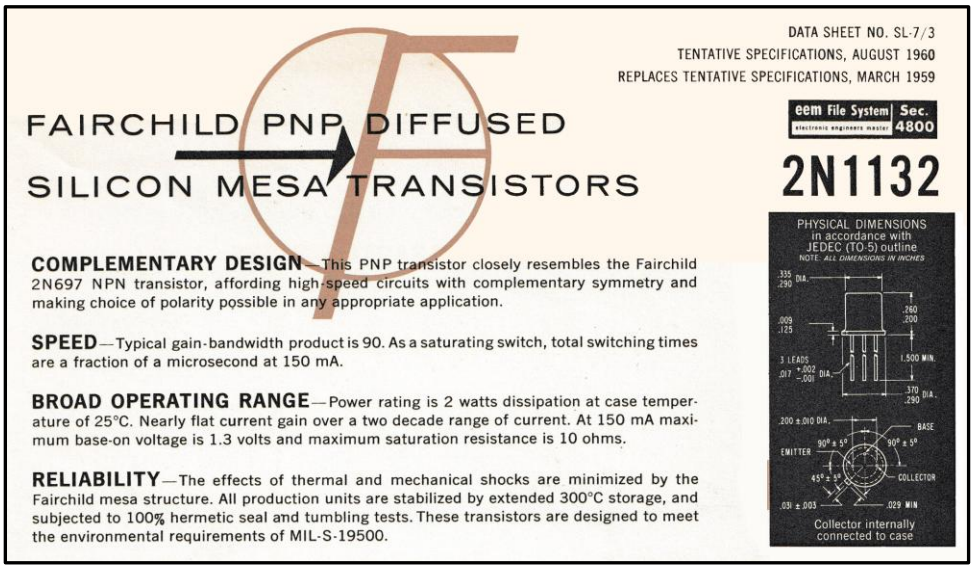
HIGH SPEED – As a saturating switch, total switching times are a fraction of a microsecond at 500 ma. Gain-bandwidth product, f_T, is typically 80 megacycles. As a low level amplifier, it provides 17 db neutralized gain at 30 megacycles. As a power output stage, it delivers 1.5 watts at 20 megacycles.

BROAD OPERATING RANGE – Power rating is 2 watts dissipation at 25°C. case temperature. Nearly flat current gain is provided over a two decade range of current. At 150 ma, the base-on voltage is 1.3 volts and maximum saturation resistance is 10 ohms.

HIGH RELIABILITY – All production units are stabilized by extended 300°C. storage. The Fairchild mesa structure minimizes the effects of thermal and mechanical shock. Units have withstood impacts greater than 20,000g for 3 ms. These transistors meet the environmental requirements of MIL-T-19500A.

PHYSICAL DIMENSIONS
in accordance with
JEDEC (TO-5) outline
NOTE: ALL DIMENSIONS IN INCHES

Collector internally connected to case



DATA SHEET NO. SL-7/3
TENTATIVE SPECIFICATIONS, AUGUST 1960
REPLACES TENTATIVE SPECIFICATIONS, MARCH 1959

eem File System Sec. 4800

FAIRCHILD PNP DIFFUSED
SILICON MESA TRANSISTORS

2N1132

COMPLEMENTARY DESIGN—This PNP transistor closely resembles the Fairchild 2N697 NPN transistor, affording high-speed circuits with complementary symmetry and making choice of polarity possible in any appropriate application.

SPEED—Typical gain-bandwidth product is 90. As a saturating switch, total switching times are a fraction of a microsecond at 150 mA.

BROAD OPERATING RANGE—Power rating is 2 watts dissipation at case temperature of 25°C. Nearly flat current gain over a two decade range of current. At 150 mA maximum base-on voltage is 1.3 volts and maximum saturation resistance is 10 ohms.

RELIABILITY—The effects of thermal and mechanical shocks are minimized by the Fairchild mesa structure. All production units are stabilized by extended 300°C storage, and subjected to 100% hermetic seal and tumbling tests. These transistors are designed to meet the environmental requirements of MIL-S-19500.

PHYSICAL DIMENSIONS
in accordance with
JEDEC (TO-5) outline
NOTE: ALL DIMENSIONS IN INCHES

Collector internally connected to case

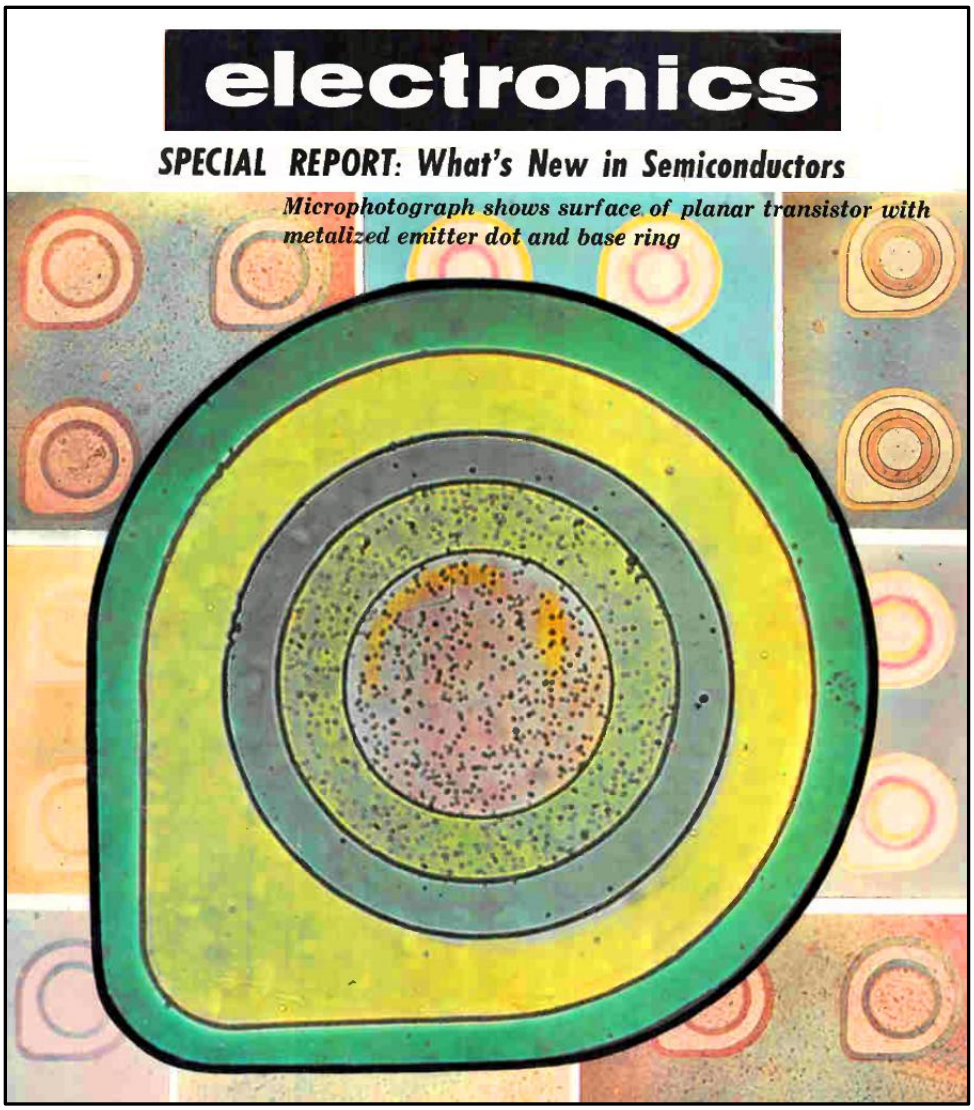
Fairchild Published Data Sheets

Shown above are top sections of early 1960s published data sheets for the Fairchild 2N696 and 2N1132 silicon mesa transistors. These data sheets were provided by Fairchild in large binders and could be kept current by customers with periodic updates. The complete data sheets for each of the above are multiple pages and provide detailed performance data to support device evaluation and circuit design by customers.

Autonetics Circuit Board with Early Fairchild Mesa Transistors

Above is an Autonetics series 3700 circuit board populated with 11 very early Fairchild transistors – these historic transistors are easily identifiable as the black-cased devices mounted across the center region of the board. There are eight 2N696 types, all dated 1960 week 2, and three 2N1131 types, all dated 1960 week 1. These eleven transistors represent some of the first Fairchild transistors and each carry the famous stamped "Flying F" case top insignia.

As discussed in historical accounts of Fairchild's early products, the Autonetics Minuteman project was a major contributor to Fairchild's success and was a primary consideration for ensuring very high reliability for these silicon mesa transistors. For the circuit board shown above, it is likely that the Fairchild transistors were manufactured and supplied to Autonetics under a specific contract and that these were then used by an Autonetics vendor in the assembly of the board. Note that this finished board demonstrates robust construction/soldering techniques and uses high quality components throughout, including 5% tolerance resistors and military grade diodes from Hughes and Transitron.



View from the Top – Fairchild's First Planar Transistor

Shown above is the iconic microphotograph of the Fairchild planar transistor structure, as featured in the Sept 29, 1961 Electronics industry magazine. Fairchild invented the breakthrough planar technology in 1959 and introduced the first commercial planar transistor in April 1960 – the 2N1613. In addition to the development of the first planar transistors, this timeframe also saw the emergence of the first integrated circuits from Fairchild and Texas Instrument. The planar process was the fundamental technology for the first Fairchild integrated circuits. Is is notable that germanium transistors were still dominant through the mid-late 1960s with millions of germanium alloy junction, surface barrier and diffused base types produced annually. However, silicon was destined to replace germanium and by the end of the 1960s germanium technology was becoming obsolete.

TECHNICAL ARTICLES AND PAPERS

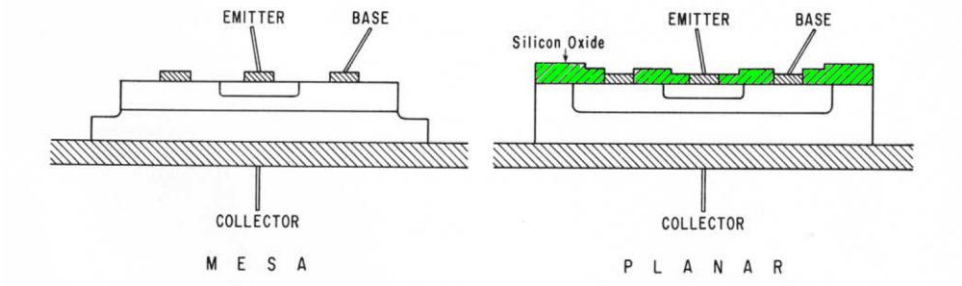
PLANAR SILICON TRANSISTORS AND DIODES

Jean A. Hoerni
Fairchild Semiconductor Corporation
Research and Development
Palo Alto, California

Presented at the 1960 Electron Devices Meeting
Washington, D. C. – October 1960

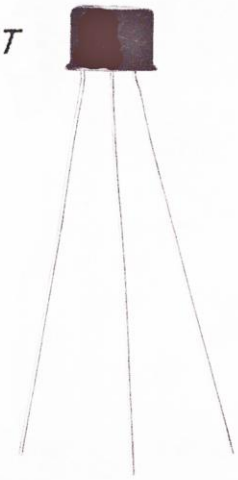
ABSTRACT TP-14

This paper describes the design and fabrication of silicon transistors and diodes of planar geometry, in which the lateral extent of the diffused layers is controlled by oxide masking. The process also incorporates the silicon oxide layer as an integral part of the device protecting the junctions at their intersection with the surface of the device. Comparison with the mesa process shows that the planar process yields values of the transistor parameters which are particularly surface sensitive (such as reverse leakage current noise figure and low current beta), as well as a tighter distribution of the same parameters for different units. Preliminary life test data are included in the discussion.



The above 1960 Technical Paper provided a detailed description of the Fairchild breakthrough "planar semiconductor technology" that was the basis for the first "high-performance Universal Transistor" (the 2N1613) as well as the first Fairchild micrologic intergrated circuits.

ANOTHER FAIRCHILD FIRST



THE UNIVERSAL TRANSISTOR

FAIRCHILD'S 2N1613

DIFFUSED SILICON PLANAR TRANSISTOR

GUARANTEED USEFUL BETAS FROM 100μA to 0.5A:
15 @ .1mA 20 @ 1mA 30 @ 150mA 15 @ 500mA
Guaranteed minimum Beta over a 5,000 to 1 range of collector current makes the 2N1613 the most versatile transistor presently on the market.

WIDE RANGE OF APPLICATIONS: in Fast Switching (logic and high current): Amplifiers (low level, low noise, wideband, VHF power).

RELIABILITY IN A NEW DIMENSION: The Planar Transistor is the most thoroughly proven transistor ever introduced commercially, with over 5,000,000 transistor hours plus 300°C. stabilization on all units.

SOME IMPORTANT PARAMETERS: 7 db — Noise Figure: 100 megacycles—Gain-bandwidth product; 0.0005μA I_{CBO} typical at 60V, 25°C.

IMMEDIATE AVAILABILITY: Quantities from 1-999 from franchised Fairchild distributors at factory prices.

TENTATIVE SPECIFICATIONS— FAIRCHILD 2N1613

f_t typical	100 mc
P_C @ 25°C. Case Temperature	3W
h_{FE} (see Beta paragraph above)	Min 30
V_{CER}	40V
V_{CBO}	75V
V_{BE}SAT. (Max.)	1.3V
V_{CE}SAT. (Max.)	1.5V
I_{CBO} @ 25°C. (Max.) measured at 60V	25mμA

FAIRCHILD SEMICONDUCTOR CORPORATION

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For full specifications, write Dept. E-5

A WHOLLY OWNED SUBSIDIARY OF FAIRCHILD CAMERA AND INSTRUMENT COMPANY

Fairchild's First Planar Transistor

Above is a section of a May 1960 Fairchild industry ad highlighting the performance characteristics of the newly introduced 2N1613 planar transistor. This device was the world's first planar transistor – note that tentative specs were available at this time. Fairchild formally registered this device with the JEDEC industry standards organization on August 15, 1960. The 2N1613 met very high reliability and performance metrics, supported by the statement in this ad: "The Planar Transistor is the most thoroughly proven transistor ever introduced commercially, with over 5,000,000 transistor hours, plus 300 C stabilization on all units." Fairchild's 2N1613 planar technology revolutionized the semiconductor industry.

Lead Wire

Vol. 2, No. 4 | Fairchild Semiconductor Corp., Mountain View, California | April 1960

HOLD CEREMONY TO BREAK GROUND FOR DIODE PLANT

The ground was symbolically broken at the site of Fairchild's diode plant in San Rafael on March 18. This was the formal beginning of a project that will end in September when a multi-million-dollar 60,000-square-foot industrial facility will stand where now only brown earth stretches across the flat acres to the foot of the hills.

"In September there will be a busy industrial complex where we're now standing. Its basic purpose will be to produce diodes at a profit—a profit that will not only show on Fairchild's books, but will be reflected in the character and landscape of Marin County."

General Manager Bob Noyce made this statement to over 60 Marin County civic and business leaders and Fairchild officials who had gathered at the building site for a brief ceremony.

"To locate our diode plant, we needed a clean area, because our manufacturing processes demand absolute cleanliness. We needed an area with an expanding high-level labor market, because nearly half of the building will be devoted to administration, sales engineering and development laboratory areas and our production people are, in a sense, well-trained technicians. We needed an area where the physical appearance of our plant would fit in harmoniously with surrounding structures, an area where our employees could find homes in attractive, convenient residential areas. We found all of this here in Marin," he told the group.

In concluding his remarks, Dr. Noyce said, "Fairchild's diode plant in San Rafael is a reality today. This fall it will be a landmark in Marin County's progress—a landmark of which all of us can be justifiably proud."

Fred P. Enemark, president of the Marin Industrial Development Foundation, introduced the speakers to the assembly and Mayor John McInnis of San Rafael and Walter Castro, Sr., chairman of the Marin Board of Supervisors, officially welcomed Fairchild to the new plant site. Preceding his remarks to the

(Continued on Page 4)

Turning the first symbolic shovelful of earth for Fairchild's San Rafael diode plant are the five men who spoke at groundbreaking ceremonies at the building site on March 18. Left to right they are Mayor of San Rafael John McInnis; Fred P. Enemark, president of the Marin Industrial Development Foundation; Robert Freund, general manager of the diode plant; Robert Noyce, vice president and general manager of Fairchild; and Walter Castro, chairman of the Marin Board of Supervisors.

FSC PLANAR BIG NEWS AT IRE SHOW

Fairchild's new planar transistor seemed to be the most talked-about development in the transistor field at this year's IRE show in New York.

Introduced to the public for the first time at the show, the 4200 line of NPN transistors received the lion's share of attention because it is nearly universal in application. It is superior to previous NPN types in power dissipation, gain, reverse leakage, and reliability.

The planar device can be used in many applications that previously required a device with special characteristics, and performs the job better than a unit specifically designed for the required job.

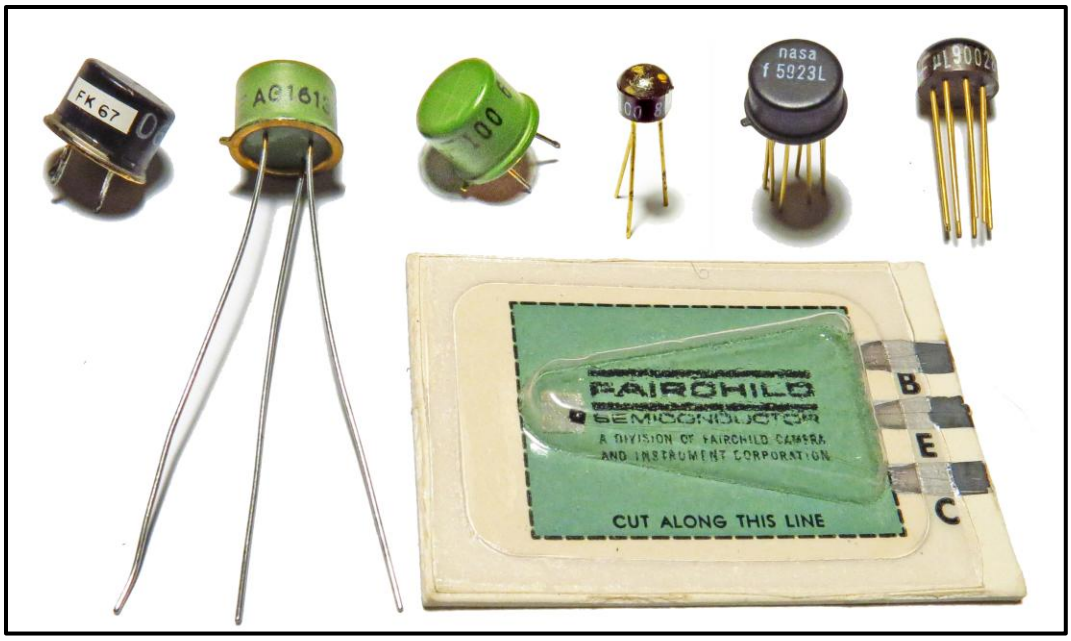
Christened the 2N 1613, the new unit is different from the mesa types in that both the collector-to-base and the base-to-emitter junctions are embedded in the top surface of the planar structure. In the mesa structure the collector-to-base junction is on the side of the device chip. The new structure has greatly reduced surface sensitivity compared to previous devices.

The planar device structure is also used in Fairchild's diode line.

NUMBER OF EMPLOYEES 1390

Fairchild Leadwire Inhouse Publication

The Computer History Museum has a large online collection of historic Fairchild documentation, including many 1950s/60s issues of Fairchild Leadwire. The April 1960 issue shown above highlights Fairchild's rapid growth with the groundbreaking celebration for the planned new diode plant. Note also the brief description of the success of the recent rollout of the 2N1613 planar transistor at the IRE show in New York. Fairchild planar technology would be used for transistor and diode production and this technology was getting rave reviews from industry.

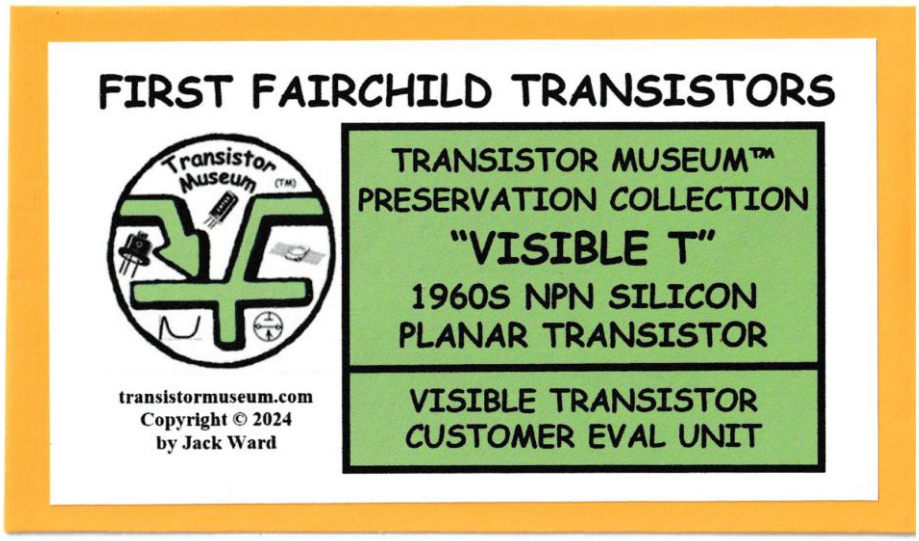


Fairchild 1960s Leading Edge Transistor Technology

At left is an early NPN mesa type with Autonetics Minuteman part number 0601 - A001 (Amendment 1). This unit has a 1960 build code with a serialized label for life-time reliability tracking. According to the May 1960 Leadwire issue, Fairchild had just received a $450,258 transistor order from Autonetics. The unit in the photo is the same type that would have been supplied in that order. The unit second from left is a green-cased special order 1613 dated 1961 - the 2N1613 was still in very early production status at this time, so this transistor is a very rare device. The other green-cased unit is a special order type with an IBM 100 part number and a 1962 date code. The IBM 100 part number is cross-referenced to type 2N1613. IBM had been an early customer for Fairchild mesa transistors and it seems this interest continued with the planar types – this also is a very rare transistor. The transistor shown above third from right is a 1968 FPT-100 photo transistor. The case top is translucent plastic that allows light to shine on the exposed transistor junctions - these can be seen connected to the gold posts in the photo. This unit has a 1968 date code. The two devices at far right are both early Fairchild integrated circuits from the mid-1960s. The NASA device is a type 923 JK flip-flop RTL uLogic IC, which contains 15 transistors and multiple integrated resistors. The uL 900 is an RTL logic gate with a similar number of transistors. These two devices represent the first types of integrated circuits developed by Fairchild. The "Visible T" transistor is from the mid-1960s and is a customer sales demo type that contains a PNP planar transistor. The devices in this photo illustrate some of the many impressive technological achievements made by Fairchild in the 1960s. A complete view of the 1969 Fairchild product line-up can be seen in this comprehensive 1969 Fairchild catalog.

Iconic Fairchild Early Semiconductor Bulk Packaging

Early semiconductor companies often developed stylized graphics and distinctive color palettes for customer-facing packaging to better establish brand recognition. This practice was used in the 1950s with the first wave of germanium transistor companies such as Western Electric, Raytheon, RCA, Sylvania, Texas Instruments, Motorola, CBS, Radio Receptor, Germanium Products Corp, and Clevite/Transistor Products. The first transistor company in Silicon Valley continued this tradition with Fairchild developing unmistakable colors/graphics to promote their pioneering products. Shown above are examples of early Fairchild packaging. The lower package is the earliest version (featuring the famous "Flying F" logo) – this was used up until the early-mid 1960s when the upper example style with a focus on planar was developed. There is no mistaking the "Fairchild Green", the "Flying F", and "Silicon Planar Devices".



Transistor Museum Preservation Collection Packaging

As shown above, each of the six historic Fairchild transistors included in this collection will be provided in a protective and identifying display and storage envelope. We have developed this approach to best protect and display these unique devices which are such an important part of semiconductor history.

These Fairchild transistors are 60+ years old. We have tested each to confirm that these historic devices are still functional, which is quite a testament to Fairchild reliability. We haven't confirmed that these transistors meet original specifications, so we can't guarantee actual performance. We trust that these old war horses will find good homes and that this amazing history will be preserved for many years to come. We have individually inspected each transistor so ensure good cosmetic condition with readable labeling.

Transistor Museum Preservation Collection Packaging

The complete packaging includes protective sleeves at the back cover of the provided documentation binder, with three envelopes per protective sleeve.

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1	Michael Riordan/Lillian Hoddeson – *Crystal Fire* This is the definitive story of the most important events leading to the invention of the transistor and the subsequent impact on technology and the information age. The material relating to Fairchild is extensive and highly readable.
2	. Fairchild Semiconductor: The 60th Anniversary of a Silicon Valley Legend Computer History Museum Curatorial Insights by David Laws. Well written blog with extensive research, commentary, photos and links. A well written discussion beginning with the first days of Fairchild and the subsequent profound impact on semiconductor technology and history. Many references.
3	IEEE Milestone: Birthplace of Silicon Valley 1956 Very comprehensive website about Shockley Semiconductor arrival as the first silicon company in Silicon Valley and the subsequent founding of Fairchild. Includes many links.
4	391 San Antonio Road: The House that William Shockley Built The EE Journal is a real treasure trove of information relating to all things electronic. Steve Leibson's article on the beginnings of Silicon Valley, Shockley and Fairchild provides some good info about these first semiconductors.
5	Diffenderfer Oral History - Working for William Shockley This Transistor Museum Oral History provides a first-hand account of the people and technology at Shockley's company, the first semiconductor company in Silicon Valley.
6	Silicon Dioxide Solution Michael Riordon's IEEE Spectrum article is a comprehensive, informative and readable account of Fairchild's early days and the development of the planar technology. Highly relevant to those interested in these first Fairchild transistors.
7	Computer History Museum Milestone – 1958 Silicon Mesa Transistors Enter Commercial Production CHM Milestone review of Fairchild Semiconductor's first transistors: double-diffused silicon mesa transistors to meet demanding aerospace applications.
8	Computer History Museum Milestone – 1959 Invention of the "Planar" Manufacturing Process CHM Milestone review of Fairchild Semiconductor's development of the silicon planar process, leading to the 2N2613 transistor and micro-logic integrated circuits.

Useful Links for Additional Research on Fairchild History

There is a wealth of excellent online documentation and research material available to delve deeper into the history of Fairchild transistor. The Computer History Museum and Crystal Fire are both highly recommended starting points – we have also listed many additional resources in the table above.