

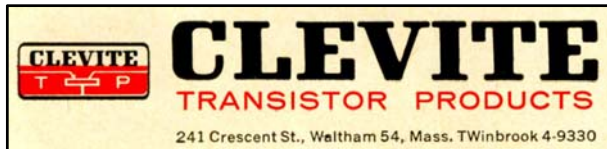
## TRANSISTOR MUSEUM™

### Historic Transistor Photo Gallery

#### U.S. Army Signal Corps Transistors from the 1950s/60s



The above 2N297 devices are date-coded 1958, and many of the units from this lot are scuffed and marked with paint dots and serial number tags, likely the results of qualification tests to meet U.S. Army requirements.



The above logo is excerpted from a 1957 Clevite power transistor ad. Note the reference to "Transistor Products", which was an early and innovative Boston area transistor company acquired by Clevite in 1953.

## CLEVITE 2N297

### TYPE

Germanium PNP Alloy Power Transistor

### USAGE

Low Frequency & Audio Power Output

### LISTING DATES

Sig C: FY 1954

JEDEC Registration: 1956

U.S. ARMY: 1958

### CASE STYLES

Standard TO-3

Black Metal

### AVAILABILITY

Rare (Limited Production)

### HISTORIC NOTES

The first transistors, from 1947 to the mid 1950s, suffered from several performance limitations, including (1) poor high frequency performance and (2) limited power handling capabilities. The FY-1954 Signal Corps transistor development program began to address some of these performance limitations by contracting with Clevite Transistor Products for the development of the 2N297 germanium alloy power transistor. This timeframe was very early in the history of transistor technology, and increased power handling capabilities were an important design goal for many of the leading transistor companies of the time, including Motorola, Sylvania, RCA, and CBS. The first versions of this early generation of germanium power transistors achieved moderate commercial success, and these transistors were primarily used in the audio output stage of 12V automobile radios. The 2N297 met its initial Sig C performance specifications, and was capable of handling 20 watts at audio frequencies. The U.S. Army was very interested in this technology and formally qualified the 2N297 for military use. The 2N297 was soon obsoleted by Clevite, which developed the better performing 2N297A for commercial and military use.

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Transistor Family	Transistor Type	Company	General Areas of Work
2N297A	PNP Germanium Alloy	Clevite	Jet rinse, surface passivation, injection alloying, dice prep., leak testing.
2N914	NPN Silicon Planar Epitaxial	Fairchild	Metalization and bonding, ball bonding, epitaxial growth.
2N336A	NPN Silicon Grown Junction	G E	Surface passivation, high temperature main sealing.
2N501A	PNP Germanium MADT	Philco	Higher melting point materials, encapsulants, 100 per cent leak tests.
2N328A	NPN Silicon Alloy	Raytheon	Chip improvements, junction formation, internal mechanical structures, surface prep., post seal stress.

Building on the excellent results achieved by the Signal Corps in the 1950s with the Industrial Preparedness Program in sponsoring industry-wide transistor developments, an updated program was initiated in 1961 which placed contracts with semiconductor manufacturers to improve the reliability of specific devices by incorporating superior manufacturing/processing techniques in their production lines. Shown above is a partial listing of the devices which were contracted for improvement, also identifying the companies and the general areas of improvement. Note the inclusion of the 2N297A contract, which funded substantial efforts to improve the earlier 2N297 device. Also of interest is the inclusion of Fairchild, and the planar transistor type - this technology was introduced by Fairchild in 1961 and completely revolutionized transistor performance. The earlier transistor technologies shown in this table became largely obsolete over the next few years. Note also the use of the "A" suffix for device types which achieve improved performance over the original device "2N" number.

**Title :** PRODUCTION ENGINEERING MEASURE FOR THE IMPROVEMENT OF GERMANIUM ALLOY POWER TRANSISTORS. FINAL RELIABILITY PROOF TESTING AND THE INDUSTRIAL PREPAREDNESS STUDY. **Accession Number :** AD0608644  
**Descriptive Note :** Final rept., vol. 1, **Corporate Author :** CLEVITE TRANSISTOR PRODUCTS WALTHAM MASS  
**Personal Author(s) :** KELLEY, Lucille T. ; LoConte, Jeremiah A. **Report Date :** 30 JUN 1964  
**Abstract :** This report covers the final process specifications and procedures for the manufacturing of the 2N297A type power transistor, including the bill of materials. All the process sequences which resulted from engineering tests and evaluations written in the contract are included in the final report manuals. The final reliability test results of the life testing has attained and exceeded the final reliability objective of 0.05% per 1000 hrs. at 95 C with 90% confidence.

Signal Corps contract work to improve the 2N297 performance and reliability was initiated in the early 1960s, and culminated with the generation of the above listed report, dated June 30, 1964. Several interim reports were also developed, documenting progress achieved at each milestone. For the 2N297A, the level of increased reliability achieved by this effort was substantial, with an over tenfold improvement compared with the 2N297, from an original 0.09% failures per 1000 hours to an improved 0.005%.