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JAN TRANSISTOR AND DIODE
CHARACTERIZATION TEST PROGRAM

FINAL REPORT
FOR
JANTX DIODE
IN5623
FEBRUARY 1977
Prepared
for
GEORGE C. MARSHALL SPACE FLIGHT CENTER
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Marshall Space Flight Center, Alabama 35812

MSFC/NASA CONTRACT No. NAS8-31944

by
HIRO TAKEDA
DCA RELIABILITY LABORATORY
SPECIAL PRODUCTS DIVISION
975 BENICIA AVE.
SUNNYVALE, CALIFORNIA 94086
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FORWARD

This report is a statistical summary of the electrical characterization performed on NASA Contract NAS-31944. This is one of a group of thirty-nine (39) such reports prepared on selected JAN and JANTX Transistors and Diodes for the George C. Marshall Space Flight Center, Huntsville, Alabama. The Contracting Officer's Technical Representative was Mr. Howard B. Meeks.

This work was performed by DCA Reliability Laboratory, Special Products Division, Sunnyvale, California under the management of Mr. Robert Starr with the special assistance of Mr. Barry Lorenzo, Mr. Kenneth Radford and Mr. Hiroharu Takeda.
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1.0 INTRODUCTION

The objective of this characterization program is to provide the necessary data to create a new class of 19500 detail specifications "JAN A CLASS".

1.1 SAMPLE SELECTION

Sample selection was made according to the following criteria:

1. Manufacturer or qualified distributor.
2. Two vendors.
3. Two date codes.

1.2 PROCUREMENT GUIDELINES

The general guidelines for procurement were:
1. Two QPL vendors
2. JAN or JANTX
3. Two (2) manufacturing lots (Date Codes), twenty-seven (27) from each lot.
2.0 TECHNICAL SUMMARY

The devices used in this report were JANTX 1N5623 Silicon Diodes manufactured by Micro Semiconductor and Semtech.

All data was acquired with three (3) digit accuracy. The data processing and calculation of statistical parameters was performed by the Tektronix S-3260 computer system using four (4) digit display.

2.1 TEST PARAMETERS AND CONDITIONS

2.1.1 \( I_R \) \( V_R = 1000V = \text{(Max. Rated } V_R) \) \( T_A = 25^\circ C \) & \( 150^\circ C \)

2.1.2 \( V_{F1} \) \( I_F = 300mA = \text{(10\% of Rated } I_F) \) \( T_A = 25^\circ C \) & \( -65^\circ C \)

2.1.3 \( V_{F2} \) \( I_F = 1.5AMP = \text{(50\% of Rated } I_F) \) \( T_A = 25^\circ C \) & \( -65^\circ C \)

2.1.4 \( V_{F3} \) \( I_F = 3.0AMP = \text{(100\% of Rated } I_F) \) \( T_A = 25^\circ C \) & \( -65^\circ C \)

2.1.5 \( C_{o1} \) \( V_R = 0V \) \( f = 100KHZ \) \( T_A = 25^\circ C \)

2.1.6 \( C_{o2} \) \( V_R = 0V \) \( f = 1MHz \) \( T_A = 25^\circ C \)

2.1.7 \( t_{rr} \) \( T_A = 25^\circ C \)
2.2 UNIT DEFINITIONS

<table>
<thead>
<tr>
<th>NAME</th>
<th>SYMBOL</th>
<th>MULTIPLIER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilo</td>
<td>K</td>
<td>$10^3$</td>
</tr>
<tr>
<td>Milli</td>
<td>M</td>
<td>$10^{-3}$</td>
</tr>
<tr>
<td>Micro</td>
<td>u</td>
<td>$10^{-6}$</td>
</tr>
<tr>
<td>Nano</td>
<td>n</td>
<td>$10^{-9}$</td>
</tr>
<tr>
<td>Pico</td>
<td>p</td>
<td>$10^{-12}$</td>
</tr>
</tbody>
</table>

Example using a statistical summary section:

1% IN AMPS AT 25 DEGREES
AT VP=2.64 VOLTS

Example using a histogram:
FIGURE 1
Device Number: IN5623
Typical Overall Cross-
25 Diameters   Sectional View
D/C 7531     MFR: Semtech

FIGURE 2
Device Number: IN5623
Typical Overall Cross-
25 Diameters   Sectional View
D/C 7631     MFR: Semtech

S/N E027789
S/N E027816
Device Number: IN5623
27 Diameters
D/C 7633

FIGURE 3
Typical Overall Cross-
Sectional View
MFR: MSC
S/N E027843

Device Number: IN5623
27 Diameters
D/C 7634

FIGURE 4
Typical Overall Cross-
Sectional View
MFR: MSC
S/N E027870
3.0 STATISTICAL SUMMARY

The Statistical Summary, pages 3-2 to 3-4, are a consolidated presentation of the data acquired formatted for easy Vendor to Vendor and date code to date code analysis. Each parameter is presented with Test Conditions, Mean, Standard Deviation, Lowest Reading, 10% Point (where 10% of all readings are equal to or less than the indicated reading), 90% Point (where 90% of all readings are equal to or less than indicated reading) and the Highest Reading.

It should be noted the Mean presented in the summary may vary slightly from that presented on the Histograms due to a slight variation in the data base used for calculation.

EXAMPLE:

MICRO. SEMICONDUCTOR: $I_R$, $V_R = 1000V$, $T_A = 25^\circ C$

Summary: MEAN 1.500uA

Histogram: MEAN 340.4nA
### VENDOR: MICROW SEMICOND

<table>
<thead>
<tr>
<th>VEND / DC</th>
<th>MEAN</th>
<th>STD. DEV.</th>
<th>LOW PT</th>
<th>10% PT</th>
<th>90% PT</th>
<th>HIGH PT</th>
</tr>
</thead>
</table>

### 1A IN AMPS AT 25 DEGREES

<table>
<thead>
<tr>
<th>VENDOR</th>
<th>MEAN</th>
<th>STD. DEV.</th>
<th>LOW PT</th>
<th>10% PT</th>
<th>90% PT</th>
<th>HIGH PT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSI / 7634</td>
<td>1.540U</td>
<td>5.23U</td>
<td>207.0N</td>
<td>248.0N</td>
<td>481.0N</td>
<td>25.50U</td>
</tr>
<tr>
<td>MSI / 7633</td>
<td>5.65U</td>
<td>114.3N</td>
<td>301.0N</td>
<td>373.0N</td>
<td>498.0N</td>
<td>2.520U</td>
</tr>
<tr>
<td>SEMI / 7631</td>
<td>5.42U</td>
<td>59.17N</td>
<td>19.70N</td>
<td>20.10N</td>
<td>96.80N</td>
<td>10.90N</td>
</tr>
<tr>
<td>SEMT / 7531</td>
<td>76.31U</td>
<td>75.15U</td>
<td>5.500N</td>
<td>9.990N</td>
<td>113.0N</td>
<td>790.0N</td>
</tr>
</tbody>
</table>

### 1A IN AMPS AT 150 DEGREES

<table>
<thead>
<tr>
<th>VENDOR</th>
<th>MEAN</th>
<th>STD. DEV.</th>
<th>LOW PT</th>
<th>10% PT</th>
<th>90% PT</th>
<th>HIGH PT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSI / 7634</td>
<td>179.7U</td>
<td>51.59U</td>
<td>105.0U</td>
<td>132.0U</td>
<td>197.0U</td>
<td>388.0U</td>
</tr>
<tr>
<td>MSI / 7633</td>
<td>216.7U</td>
<td>90.77U</td>
<td>81.10U</td>
<td>89.10U</td>
<td>301.0U</td>
<td>357.0U</td>
</tr>
<tr>
<td>SEMI / 7631</td>
<td>31.47U</td>
<td>10.40U</td>
<td>16.16U</td>
<td>20.10U</td>
<td>40.30U</td>
<td>63.60U</td>
</tr>
<tr>
<td>SEMT / 7531</td>
<td>47.36U</td>
<td>20.24U</td>
<td>23.90U</td>
<td>24.30U</td>
<td>71.10U</td>
<td>99.90U</td>
</tr>
</tbody>
</table>

### VF1 IN VOLTS AT 25 DEGREES

<table>
<thead>
<tr>
<th>VENDOR</th>
<th>MEAN</th>
<th>STD. DEV.</th>
<th>LOW PT</th>
<th>10% PT</th>
<th>90% PT</th>
<th>HIGH PT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSI / 7634</td>
<td>1.019</td>
<td>45.28M</td>
<td>928.0M</td>
<td>950.0M</td>
<td>1.070</td>
<td>1.090</td>
</tr>
<tr>
<td>MSI / 7633</td>
<td>998.8M</td>
<td>5.214M</td>
<td>914.0M</td>
<td>928.0M</td>
<td>1.060</td>
<td>1.060</td>
</tr>
<tr>
<td>SEMI / 7631</td>
<td>804.5M</td>
<td>166.5M</td>
<td>807.0M</td>
<td>808.0M</td>
<td>355.0M</td>
<td>933.0M</td>
</tr>
<tr>
<td>SEMT / 7531</td>
<td>787.6M</td>
<td>181.1M</td>
<td>813.0M</td>
<td>822.0M</td>
<td>821.0M</td>
<td>881.0M</td>
</tr>
<tr>
<td>VEND / DC</td>
<td>MEAN</td>
<td>STD. DEV.</td>
<td>LOW PT</td>
<td>10% PT</td>
<td>90% PT</td>
<td>HIGH PT</td>
</tr>
<tr>
<td>-----------</td>
<td>------</td>
<td>-----------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
</tr>
<tr>
<td>Vf1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vf2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vf3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Vf3 1st Volts at -65 Degrees

<table>
<thead>
<tr>
<th>VEND / UC</th>
<th>MEAN</th>
<th>STD. DEV.</th>
<th>LOW PT</th>
<th>10% PT</th>
<th>90% PT</th>
<th>HIGH PT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS1 / 7634</td>
<td>1.504</td>
<td>76.90m</td>
<td>1.360</td>
<td>1.370</td>
<td>1.580</td>
<td>1.640</td>
</tr>
<tr>
<td>MS1 / 7633</td>
<td>1.492</td>
<td>90.02m</td>
<td>1.300</td>
<td>1.330</td>
<td>1.560</td>
<td>1.580</td>
</tr>
<tr>
<td>SEMT / 7631</td>
<td>1.325</td>
<td>54.67m</td>
<td>1.210</td>
<td>1.240</td>
<td>1.400</td>
<td>1.450</td>
</tr>
<tr>
<td>SEMT / 7531</td>
<td>2.809</td>
<td>7.146</td>
<td>1.240</td>
<td>1.240</td>
<td>1.440</td>
<td>1.530</td>
</tr>
</tbody>
</table>

### C01 Farads at 25 Degrees

<table>
<thead>
<tr>
<th>VEND / UC</th>
<th>MEAN</th>
<th>STD. DEV.</th>
<th>LOW PT</th>
<th>10% PT</th>
<th>90% PT</th>
<th>HIGH PT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS1 / 7634</td>
<td>14.72P</td>
<td>7.041P</td>
<td>7.360P</td>
<td>8.380P</td>
<td>19.06P</td>
<td>38.00P</td>
</tr>
<tr>
<td>SEMT / 7631</td>
<td>58.57P</td>
<td>8.590P</td>
<td>47.03P</td>
<td>49.03P</td>
<td>72.43P</td>
<td>75.20P</td>
</tr>
<tr>
<td>SEMT / 7531</td>
<td>55.17P</td>
<td>5.911P</td>
<td>47.29P</td>
<td>49.55P</td>
<td>59.62P</td>
<td>73.44P</td>
</tr>
</tbody>
</table>

### C02 Farads at 25 Degrees

<table>
<thead>
<tr>
<th>VEND / UC</th>
<th>MEAN</th>
<th>STD. DEV.</th>
<th>LOW PT</th>
<th>10% PT</th>
<th>90% PT</th>
<th>HIGH PT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS1 / 7634</td>
<td>14.13P</td>
<td>2.467P</td>
<td>5.850P</td>
<td>5.090P</td>
<td>12.03P</td>
<td>13.80P</td>
</tr>
<tr>
<td>MS1 / 7633</td>
<td>13.17P</td>
<td>7.962P</td>
<td>2.471P</td>
<td>4.770P</td>
<td>4.860P</td>
<td>10.09P</td>
</tr>
<tr>
<td>SEMT / 7631</td>
<td>48.59P</td>
<td>2.158P</td>
<td>44.42P</td>
<td>45.72P</td>
<td>51.18P</td>
<td>52.45P</td>
</tr>
<tr>
<td>SEMT / 7531</td>
<td>48.59P</td>
<td>2.172P</td>
<td>44.72P</td>
<td>45.00P</td>
<td>50.89P</td>
<td>53.94P</td>
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</tbody>
</table>

### TCK in Secs at 25 Degrees

<table>
<thead>
<tr>
<th>VEND / UC</th>
<th>MEAN</th>
<th>STD. DEV.</th>
<th>LOW PT</th>
<th>10% PT</th>
<th>90% PT</th>
<th>HIGH PT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS1 / 7634</td>
<td>230.4N</td>
<td>4.191N</td>
<td>220.0N</td>
<td>220.0N</td>
<td>240.0N</td>
<td>250.0N</td>
</tr>
<tr>
<td>MS1 / 7633</td>
<td>231.6N</td>
<td>13.1N</td>
<td>700.0N</td>
<td>270.0N</td>
<td>250.0N</td>
<td>250.0N</td>
</tr>
<tr>
<td>SEMT / 7631</td>
<td>397.4N</td>
<td>50.66N</td>
<td>310.0N</td>
<td>310.0N</td>
<td>460.0N</td>
<td>480.0N</td>
</tr>
<tr>
<td>SEMT / 7531</td>
<td>326.8N</td>
<td>60.97N</td>
<td>230.0N</td>
<td>230.0N</td>
<td>400.0N</td>
<td>450.0N</td>
</tr>
</tbody>
</table>