

# New Jersey Semi-Conductor Products, Inc.

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## PNP GERMANIUM ALLOY JUNCTION POWER TRANSISTORS

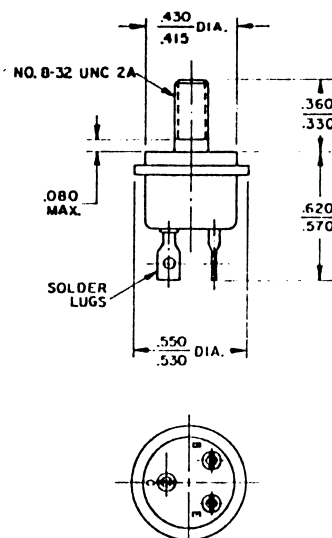
These hermetically sealed germanium PNP power transistors are designed for use in servo amplifiers, power converters, relay drives, voltage regulators, switching applications, etc. They are capable of dissipating 10 watts at a case temperature of 71°C and currents of 3 amp. Dynamic testing of electrical parameters assures conformance to users' requirements.

Welded construction of the TO 10 case and true hermetic seal of glass-to-metal terminal header provides assurance of performance in environmental extremes. Widely spaced terminal lugs are plated to facilitate lead attachment in production and are securely anchored to prevent possible damage in use. All heat sink surfaces are plated to avoid corrosion, which would otherwise introduce electrical or thermal discontinuities.

### DESIGN LIMITS

|                                                        | 2N538<br>2N538A | 2N539<br>2N539A | 2N540<br>2N540A |
|--------------------------------------------------------|-----------------|-----------------|-----------------|
| Collector-to-Base Voltage, $V_{CB}$                    | -80             | -80             | -80 Volts       |
| Collector-to-Emitter Voltage, $V_{CE}$                 |                 |                 |                 |
| Active Region (emitter forward biased)                 | -60             | -55             | -55 Volts       |
| Cutoff Region (emitter reverse biased)                 | -80             | -80             | -80 Volts       |
| Emitter-to-Base Voltage, $V_{EB}$                      | -28             | -28             | -28 Volts       |
| Emitter Current (rms), $I_E$                           | -3.5            | -3.5            | -3.5 Amp.       |
| Base Current (rms), $I_B$                              | -0.5            | -0.5            | -0.5 Amp.       |
| Operating and Junction Temperature, $T_J$              | -65 to +100     | -65 to +100     | -65 to +100°C   |
| Thermal Resistance, Junction to Mounting Base $\theta$ | 2.2             | 2.2             | 2.2°C/W         |

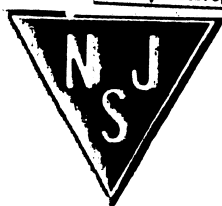
|        |        |
|--------|--------|
| 2N538  | 2N539A |
| 2N538A | 2N540  |
| 2N539  | 2N540A |



### CHARACTERISTICS AT 25°C

|                                                      |        | Min.  | Typ. | Max.  | Unit |
|------------------------------------------------------|--------|-------|------|-------|------|
| Current Gain, $H_{FE}$                               | 2N538  | 20    | 30   | 50    | —    |
| Common Emitter, $H_{FE}$                             | 2N538A | 20    | 30   | 50    | —    |
| $I_C = -2a; V_{CE} = -2v$                            | 2N539  | 30    | 43   | 75    | —    |
|                                                      | 2N539A | 30    | 43   | 75    | —    |
|                                                      | 2N540  | 45    | 64   | 113   | —    |
|                                                      | 2N540A | 45    | 64   | 113   | —    |
| Base-to-Emitter Voltage, $V_{BE}$                    | 2N538  | -1.33 | -2.2 | -3.33 | Volt |
| $I_C = -2a; V_{CE} = -2v$                            | 2N538A | -1.33 | -2.2 | -3.33 | Volt |
|                                                      | 2N539  | -1.0  | -1.7 | -2.5  | Volt |
|                                                      | 2N539A | -1.0  | -1.7 | -2.5  | Volt |
|                                                      | 2N540  | -0.75 | -1.3 | -1.88 | Volt |
|                                                      | 2N540A | -0.75 | -1.3 | -1.88 | Volt |
| Power Conductance-Common Emitter, $G_p$              | 2N538A | 17.5  | 27   | 52    | Mho  |
| $I_C = -2a; V_{CE} = -2v$                            | 2N539A | 35    | 51   | 105   | Mho  |
|                                                      | 2N540A | 71    | 100  | 213   | Mho  |
| Input Resistance-Common Emitter, $H_{ie}$            | 2N538A | 24    | 33   | 48    | Ohm  |
| $I_C = -2a; V_{CE} = -2v$                            | 2N539A | 27    | 37   | 54    | Ohm  |
|                                                      | 2N540A | 30    | 42   | 60    | Ohm  |
| Thermal Resistance, Junction-Mounting Base, $\theta$ |        | —     | 1.7  | 2.2   | °C/W |
| Time response of Junction Temperature, $\tau$        |        | 10    | 30   | —     | Ms   |

|                                                                           |                  | Min. | Typ.            | Max.  | Unit |
|---------------------------------------------------------------------------|------------------|------|-----------------|-------|------|
| Collector Junction Leakage Current, $I_{CBO}$                             | $I_E = 0$        | —    | —               | —     | —    |
|                                                                           | $V_{CB} = -2v$   | —    | -0.04           | -0.1  | ma   |
|                                                                           | $V_{CB} = -28v$  | —    | -0.1            | -1.0  | ma   |
|                                                                           | $V_{CB} = -80v$  | —    | —               | -2.0  | ma   |
| Alpha = 1 Voltage, Collector Junction, $V_{\alpha} = 1$                   | See Reverse side | -60  | (2N538, 2N538A) | Volts |      |
|                                                                           |                  | -55  | (2N539, 2N539A) | Volts |      |
|                                                                           |                  | -55  | (2N540, 2N540A) | Volts |      |
| Emitter Floating Potential, $V_{EF}$                                      | $R_{EB} = 10K$   | —    | —               | —     | —    |
|                                                                           | $V_{CB} = 60V$   | —    | -0.1            | -0.3  | Volt |
|                                                                           | $V_{CB} = -80V$  | —    | —               | -0.5  | Volt |
| Emitter Junction Leakage Current, $I_{EBO}$                               | $I_C = 0$        | —    | —               | —     | —    |
|                                                                           | $V_{EB} = -2V$   | —    | -0.03           | -0.15 | ma   |
|                                                                           | $V_{EB} = -28V$  | —    | -0.15           | -2.0  | ma   |
| Collector Saturation Voltage, $V_s$                                       | $I_C = -2a$      | —    | -0.15           | -0.6  | Volt |
|                                                                           | $I_B = -200ma$   | —    | —               | —     | —    |
| Gain Bandwidth Product $h_{fe} \cdot f_{\alpha}, (\approx f_{\alpha cc})$ | $I_C = -100ma$   | 200  | —               | —     | KC   |
|                                                                           | $V_{CE} = -4v$   | —    | —               | —     | —    |
|                                                                           | $I_B = -1ma$     | —    | —               | —     | —    |



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