

# NE521

## High-Speed Dual-Differential Comparator/Sense Amp

### Features

- TTL-Compatible Strobes and Outputs
- Large Common-Mode Input Voltage Range
- Operates from Standard Supply Voltages
- Pb-Free Packages are Available

### Applications

- MOS Memory Sense Amp
- A-to-D Conversion
- High-Speed Line Receiver

### MAXIMUM RATINGS

| Rating  | Symbol                           | Value         | Unit |
|---|----------------------------------|---------------|------|
| Supply Voltage<br>Positive<br>Negative                                  | V <sub>+</sub><br>V <sub>-</sub> | +7.0<br>-7.0  | V    |
| Differential Input Voltage  | V <sub>IDR</sub>                 | ±6.0          | V    |
| Input Voltage<br>Common Mode<br>Strobe/Gate                             | V <sub>IN</sub>                  | ±5.0<br>+5.25 | V    |
| Maximum Power Dissipation (Note 1)<br>T <sub>A</sub> = 25°C (Still-Air) | P <sub>D</sub>                   | 1420<br>1040  | mW   |
|   | N Package<br>D Package           |               |      |
| Thermal Resistance, Junction-to-Ambient                                 | R <sub>θJA</sub>                 | 100<br>145    | °C/W |
|   | N Package<br>D Package           |               |      |
| Operating Temperature Range   | T <sub>A</sub>                   | 0 to 70       | °C   |
| Storage Temperature Range   | T <sub>stg</sub>                 | -65 to +150   | °C   |
| Operating Junction Temperature  | T <sub>J</sub>                   | 150           | °C   |
| Lead Soldering Temperature (10 sec max)                                 | T <sub>slid</sub>                | +230          | °C   |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Derate above 25°C at the following rates:

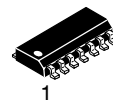
- N package at 10 mW/°C
- D package at 6.9 mW/°C.



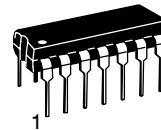
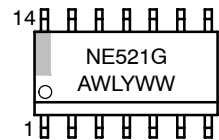
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### MARKING DIAGRAMS



SOIC-14  
D SUFFIX  
CASE 751A



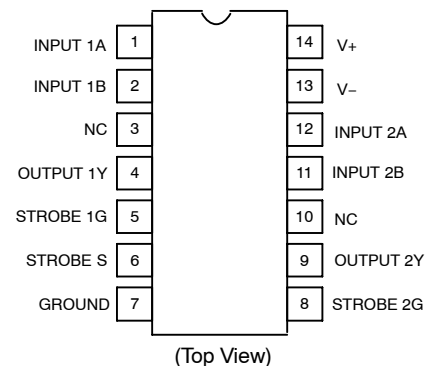
PDIP-14  
N SUFFIX  
CASE 646



A = Assembly Location  
WL = Wafer Lot  
Y, YY = Year  
WW = Work Week  
G = Pb-Free Package

### PIN CONNECTIONS

#### D, N Packages



### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

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## LOGIC FUNCTION TABLE

| $V_{ID} (A^+, B)$           | Strobe S | Strobe G | Output (Y) |
|-----------------------------|----------|----------|------------|
| $V_{ID} \leq -V_{OS}$       | H        | H        | L          |
| $-V_{OS} < V_{ID} < V_{OS}$ | H        | H        | Undefined  |
| $V_{ID} \geq V_{OS}$        | H        | H        | H          |
| X                           | L        | X        | H          |
| X                           | X        | L        | H          |

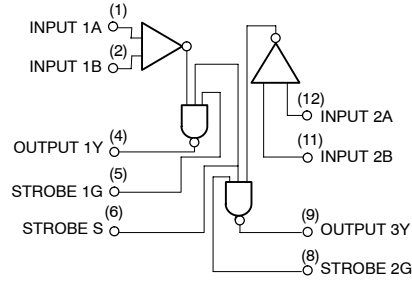


Figure 1. Block Diagram

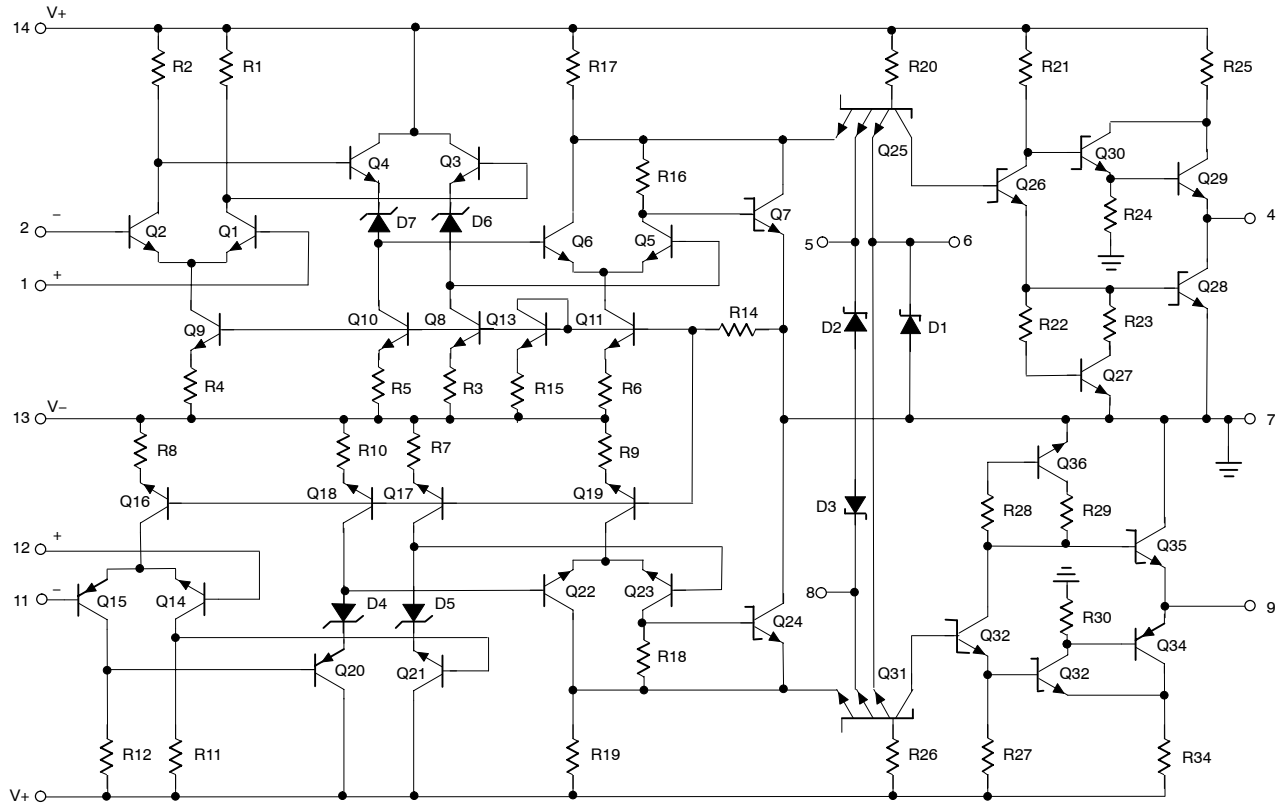


Figure 2. Equivalent Schematic

# NE521

## DC ELECTRICAL CHARACTERISTICS ( $V_+ = +5.0\text{ V}$ ; $V_- = -5.0\text{ V}$ , $T_A = 0^\circ\text{C}$ to $+70^\circ\text{C}$ , unless otherwise noted.)

| Characteristic   | Test Conditions  | Symbol     | Limits |          |              | Unit          |
|--|--|------------|--------|----------|--------------|---------------|
|  |  |            | Min    | Typ      | Max          |               |
| Input Offset Voltage<br>At 25°C<br>Overtemperature Range | $V_+ = +4.75\text{ V}$ ; $V_- = -4.75\text{ V}$  | $V_{OS}$   | –<br>– | 6.0<br>– | 7.5<br>10    | mV            |
| Input Bias Current<br>At 25°C<br>Overtemperature Range   | $V_+ = +5.25\text{ V}$ ; $V_- = -5.25\text{ V}$  | $I_{BIAS}$ | –<br>– | 7.5<br>– | 20<br>40     | $\mu\text{A}$ |
| Input Offset Current<br>At 25°C<br>Overtemperature Range | $V_+ = +5.25\text{ V}$ ; $V_- = -5.25\text{ V}$  | $I_{OS}$   | –<br>– | 1.0<br>– | 5.0<br>12    | $\mu\text{A}$ |
| Common-Mode Voltage Range                                | $V_+ = +4.75\text{ V}$ ; $V_- = -4.75\text{ V}$  | $V_{CM}$   | –3.0   | –        | +3.0         | V             |
| Input Current<br>High                                    | $V_+ = +5.25\text{ V}$ ; $V_- = -5.25\text{ V}$<br>$V_{IH} = 2.7\text{ V}$<br>1G or 2G Strobe<br>Common Strobe S | $I_{IH}$   | –<br>– | –<br>–   | 50<br>100    | $\mu\text{A}$ |
| Input Current<br>Low                                     | $V_{IL} = 0.5\text{ V}$<br>1G or 2G Strobe<br>Common Strobe S  | $I_{IL}$   | –<br>– | –<br>–   | –2.0<br>–4.0 | mA            |
| Output Voltage<br>High                                   | $V_{I(S)} = 2.0\text{ V}$<br>$V_+ = +4.75\text{ V}$ ; $V_- = -4.75\text{ V}$ ;<br>$I_{LOAD} = -1.0\text{ mA}$    | $V_{OH}$   | 2.7    | 3.4      |              | V             |
| Output Voltage<br>Low                                    | $V_+ = +5.25\text{ V}$ ; $V_- = -5.25\text{ V}$ ;<br>$I_{LOAD} = 20\text{ mA}$                                   | $V_{OL}$   |        |          | 0.5          | V             |
| Supply Voltage<br>Positive                               | –  | $V_+$      | 4.75   | 5.0      | 5.25         | V             |
| Supply Voltage<br>Negative                               | –  | $V_-$      | –4.75  | –5.0     | –5.25        | V             |
| Supply Current<br>Positive                               | $V_+ = +5.25\text{ V}$ ; $V_- = -5.25\text{ V}$ ;<br>$T_A = 25^\circ\text{C}$                                    | $I_{CC+}$  | –      | 27       | 35           | mA            |
| Supply Current<br>Negative                               |  | $I_{CC-}$  | –      | –15      | –28          | mA            |
| Short-Circuit Output Current                             | –  | $I_{SC}$   | –40    | –        | –100         | mA            |

## AC ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ ; $R_L = 280\ \Omega$ ; $C_L = 15\text{ pF}$ , $V_+ = 5.0\text{ V}$ ; $V_- = 5.0\text{ V}$ , guaranteed by characterization)

| Characteristic                            | From Input | To Output | Symbol       | Limits |     |     | Unit |
|---|------------|-----------|--------------|--------|-----|-----|------|
|   |            |           |              | Min    | Typ | Max |      |
| <b>Large-Signal Switching Speed</b>       |            |           |              |        |     |     |      |
| Propagation Delay<br>Low to High (Note 2) | Amp        | Output    | $t_{PLH(D)}$ | –      | 9.6 | 12  | ns   |
| High to Low (Note 2)                      | Amp        | Output    | $t_{PHL(D)}$ | –      | 8.2 | 9.0 |      |
| Low to High (Note 3)                      | Strobe     | Output    | $t_{PLH(S)}$ | –      | 4.8 | 10  |      |
| High to Low (Note 3)                      | Strobe     | Output    | $t_{PHL(S)}$ | –      | 3.9 | 6.0 |      |
| Max. Operating Frequency                  | –          | –         | $f_{MAX}$    | 40     | 55  | –   | MHz  |

- Response time measured from 0 V point of  $\pm 100\text{ mV}_{P-P}$  10 MHz square wave to the 1.5 V point of the output.
- Response time measured from 1.5 V point of input to 1.5 V point of the output.

TYPICAL PERFORMANCE CHARACTERISTICS

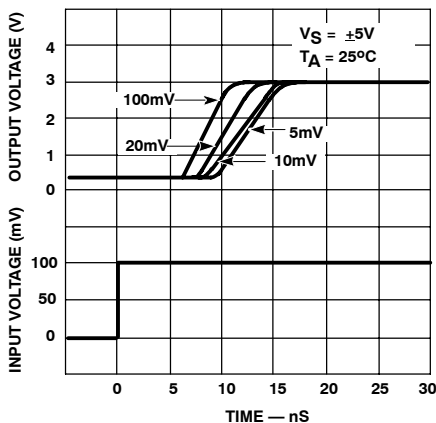


Figure 3. Response Time for Various Input Overdrives

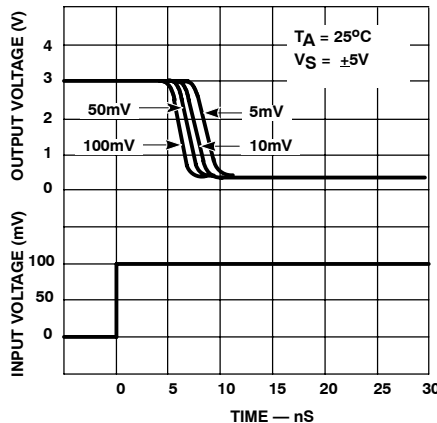


Figure 4. Response Time for Various Input Overdrives

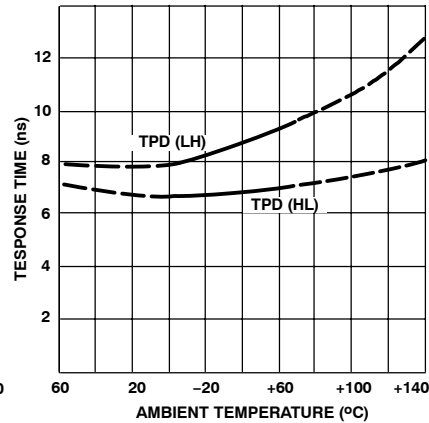


Figure 5. Response Time vs. Temperature

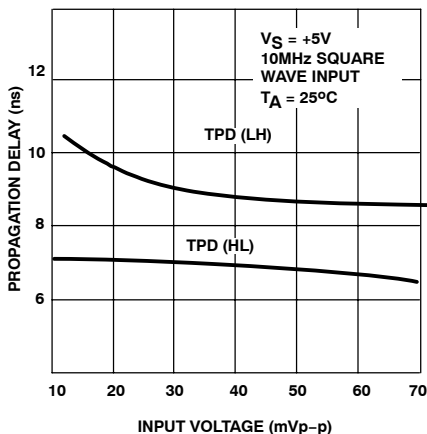


Figure 6. Propagation Delay for Various Input Voltages

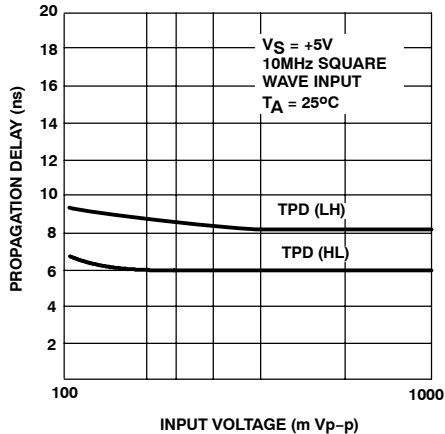


Figure 7. Propagation Delay for Various Input Voltages

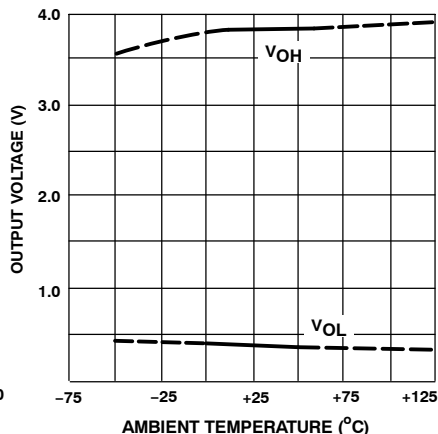


Figure 8. Output Voltage vs. Ambient Temperature

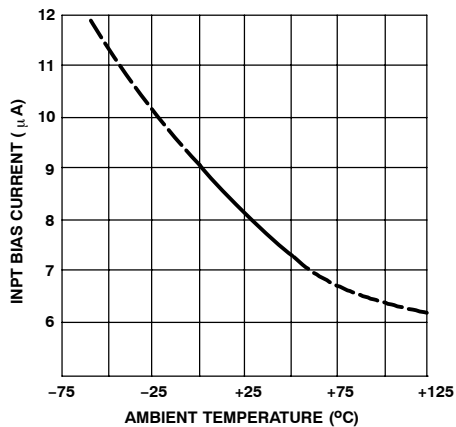


Figure 9. Input Bias Current vs. Ambient Temperature

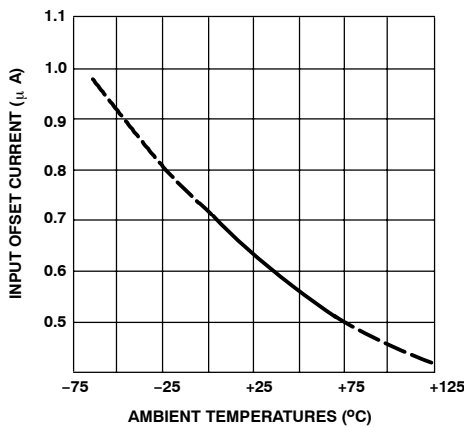


Figure 10. Input Offset Current vs. Ambient Temperature

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## ORDERING INFORMATION

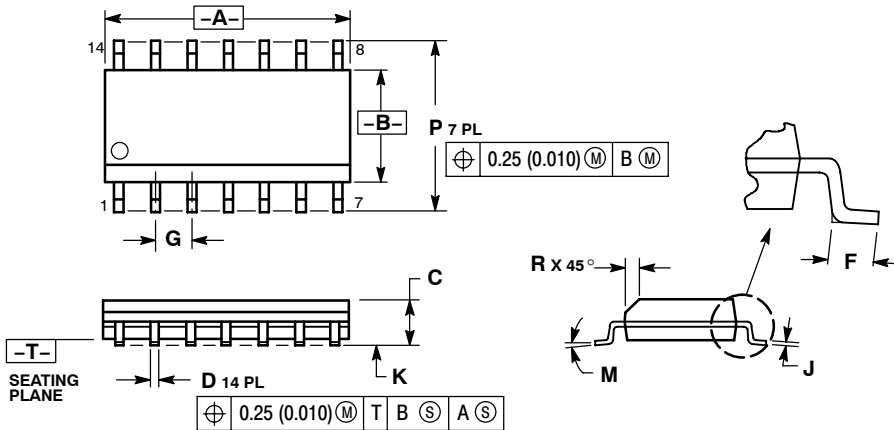
| Device    | Temperature Range | Package              | Shipping†        |
|-----------|-------------------|----------------------|------------------|
| NE521D    | 0 to +70°C        | SOIC-14              | 55 Units/Rail    |
| NE521DG   |                   | SOIC-14<br>(Pb-Free) |                  |
| NE521DR2  |                   | SOIC-14              | 2500/Tape & Reel |
| NE521DR2G |                   | SOIC-14<br>(Pb-Free) |                  |
| NE521N    |                   | PDIP-14              | 25 Units/Rail    |
| NE521NG   |                   | PDIP-14<br>(Pb-Free) |                  |

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

# NE521

## PACKAGE DIMENSIONS

SOIC-14  
CASE 751A-03  
ISSUE H

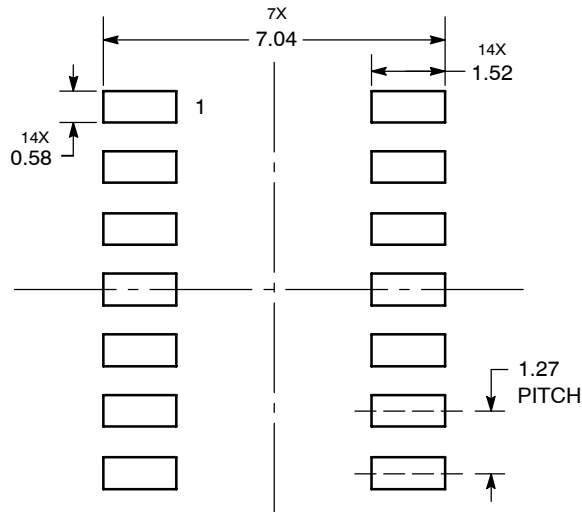


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

| DIM | MILLIMETERS |      | INCHES    |       |
|-----|-------------|------|-----------|-------|
|     | MIN         | MAX  | MIN       | MAX   |
| A   | 8.55        | 8.75 | 0.337     | 0.344 |
| B   | 3.80        | 4.00 | 0.150     | 0.157 |
| C   | 1.35        | 1.75 | 0.054     | 0.068 |
| D   | 0.35        | 0.49 | 0.014     | 0.019 |
| F   | 0.40        | 1.25 | 0.016     | 0.049 |
| G   | 1.27 BSC    |      | 0.050 BSC |       |
| J   | 0.19        | 0.25 | 0.008     | 0.009 |
| K   | 0.10        | 0.25 | 0.004     | 0.009 |
| M   | 0°          | 7°   | 0°        | 7°    |
| P   | 5.80        | 6.20 | 0.228     | 0.244 |
| R   | 0.25        | 0.50 | 0.010     | 0.019 |

### SOLDERING FOOTPRINT\*



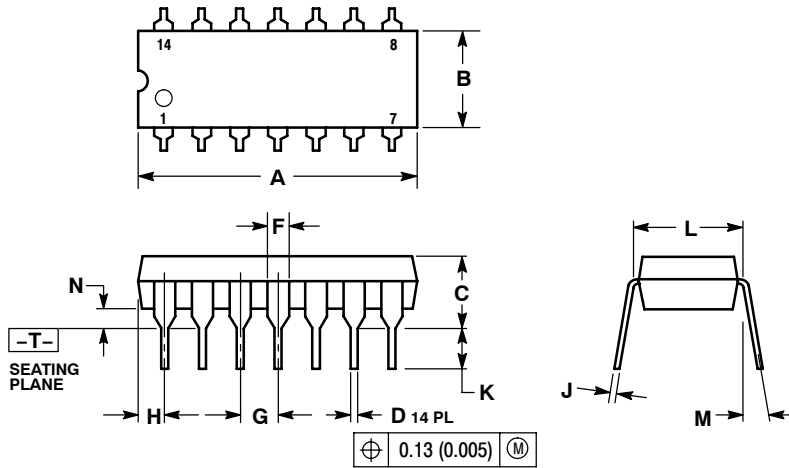
DIMENSIONS: MILLIMETERS

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# NE521

## PACKAGE DIMENSIONS

**PDIP-14**  
CASE 646-06  
ISSUE P



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.715     | 0.770 | 18.16       | 19.56 |
| B   | 0.240     | 0.260 | 6.10        | 6.60  |
| C   | 0.145     | 0.185 | 3.69        | 4.69  |
| D   | 0.015     | 0.021 | 0.38        | 0.53  |
| F   | 0.040     | 0.070 | 1.02        | 1.78  |
| G   | 0.100 BSC |       | 2.54 BSC    |       |
| H   | 0.052     | 0.095 | 1.32        | 2.41  |
| J   | 0.008     | 0.015 | 0.20        | 0.38  |
| K   | 0.115     | 0.135 | 2.92        | 3.43  |
| L   | 0.290     | 0.310 | 7.37        | 7.87  |
| M   | ---       | 10°   | ---         | 10°   |
| N   | 0.015     | 0.039 | 0.38        | 1.01  |

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**NE521/D**