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## NTE2659 (NPN) & NTE2660 (PNP) Silicon Complementary Transistors Medium Power

**Features:**

- Low Saturation Voltage

**Applications:**

- Motor Driver
- DC-to-DC Converters

**Absolute Maximum Ratings:** ( $T_A = +25^\circ\text{C}$  unless otherwise specified)

|  |                                     |
|--|-------------------------------------|
| Collector-Base Voltage, $V_{CBO}$ .....                                    | 35V                                 |
| Collector-Emitter Voltage, $V_{CEO}$ .....                                 | 25V                                 |
| Emitter-Base Voltage, $V_{EBO}$ .....                                      | 5V                                  |
| Peak Pulse Current, $I_{CM}$ .....   | 6A                                  |
| Continuous Collector Current, $I_C$ .....                                  | 2A                                  |
| Collector Power Dissipation ( $T_A = +25^\circ\text{C}$ ), $P_{tot}$ ..... | 1W                                  |
| Derate above $+25^\circ\text{C}$ .....                                     | 5.7mW/ $^\circ\text{C}$             |
| Operating Temperature Range, $T_{opr}$ .....                               | $-55^\circ$ to $+200^\circ\text{C}$ |
| Storage Temperature Range, $T_{stg}$ .....                                 | $-55^\circ$ to $+200^\circ\text{C}$ |
| Thermal Resistance, Junction-to-Ambient, $R_{thJA1}$ .....                 | 175 $^\circ\text{C}/\text{W}$       |
| Thermal Resistance, Junction-to-Ambient (Note 1), $R_{thJA2}$ .....        | 116 $^\circ\text{C}/\text{W}$       |
| Thermal Resistance, Junction-to-Case, $R_{thJC}$ .....                     | 70 $^\circ\text{C}/\text{W}$        |

Note 1. Device mounted on P.C.B. with copper equal to 1sq. Inch minimum

**Electrical Characteristics:** ( $T_A = +25^\circ\text{C}$  unless otherwise specified)

| Parameter                            | Symbol        | Test Conditions                                    | Min | Typ  | Max  | Unit          |
|--------------------------------------|---------------|--|-----|------|------|---------------|
| Collector-Base Breakdown Voltage     | $V_{(BR)CBO}$ | $I_C = 100\mu\text{A}$                             | 35  | -    | -    | V             |
| Collector-Emitter Breakdown Voltage  | $V_{(BR)CEO}$ | $I_C = 10\text{mA}$ , Note 2                       | 25  | -    | -    | V             |
| Emitter-Base Breakdown Voltage       | $V_{(BR)EBO}$ | $I_E = 100\mu\text{A}$                             | 5   | -    | -    | V             |
| Collector Cut-Off Current            | $I_{CBO}$     | $V_{CB} = 30\text{V}$                              | -   | -    | 0.1  | $\mu\text{A}$ |
|                                      |               | $V_{CB} = 30\text{V}$ , $T_A = +100^\circ\text{C}$ | -   | -    | 10   |               |
| Emitter Cut-Off Current              | $I_{EBO}$     | $V_{EB} = 4\text{V}$                               | -   | -    | 0.1  | $\mu\text{A}$ |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_C = 1\text{A}$ , $I_B = 100\text{mA}$ , Note 2  | -   | 0.12 | 0.3  | V             |
|                                      |               | $I_C = 2\text{A}$ , $I_B = 200\text{mA}$ , Note 2  | -   | 0.23 | 0.5  |               |
| Base-Emitter Saturation Voltage      | $V_{BE(sat)}$ | $I_C = 1\text{A}$ , $I_B = 100\text{mA}$ , Note 2  | -   | 0.9  | 1.25 | V             |
| Base-Emitter Turn-On Voltage         | $V_{BE(on)}$  | $I_C = 1\text{A}$ , $V_{CE} = 2\text{V}$ , Note 2  | -   | 0.8  | 1    | V             |

Note 2. Measured under pulsed conditions: Pulse Width = 300 $\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

**Electrical Characteristics (Cont'd) :** ( $T_A = +25^\circ\text{C}$  unless otherwise specified)

| Parameter                             | Symbol    | Test Conditions  | Min | Typ | Max | Unit |
|---------------------------------------|-----------|--|-----|-----|-----|------|
| Static Forward Current Transfer Ratio | $h_{FE}$  | $I_C = 50\text{mA}, V_{CE} = 2\text{V}, \text{Note 2}$               | 70  | 200 | -   |      |
|                                       |           | $I_C = 1\text{A}, V_{CE} = 2\text{V}, \text{Note 2}$                 | 100 | 200 | 300 |      |
|                                       |           | $I_C = 2\text{A}, V_{CE} = 2\text{V}, \text{Note 2}$                 | 75  | 150 | -   |      |
|                                       |           | $I_C = 6\text{A}, V_{CE} = 2\text{V}, \text{Note 2}$                 | 15  | 50  | -   |      |
| Transition Frequency<br>NTE2659       | $f_T$     | $I_C = 100\text{mA}, V_{CE} = 5\text{V}, f = 100\text{MHz}$          | 150 | 240 | -   | MHz  |
| NTE2660                               |           |  | 100 | 160 | -   |      |
| Output Capacitance<br>NTE2659         | $C_{obo}$ | $V_{CB} = 10\text{V}, f = 1\text{MHz}$                               | -   | 25  | 50  | pF   |
| NTE2660                               |           | $I_C = 100\text{mA}, V_{CE} = 5\text{V}, f = 100\text{MHz}$          | -   | 55  | 100 |      |
| Switching Times<br>NTE2659            | $t_{on}$  | $I_C = 500\text{mA}, V_{CC} = 10\text{V}, I_{B1}=I_{B2}=50\text{mA}$ | -   | 55  | -   | ns   |
|                                       | $t_{off}$ |  | -   | 300 | -   |      |
|                                       | $t_{on}$  |  | -   | 40  | -   | ns   |
| NTE2660                               | $t_{off}$ |  | -   | 450 | -   |      |

Note 2. Measured under pulsed conditions: Pulse Width =  $300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

