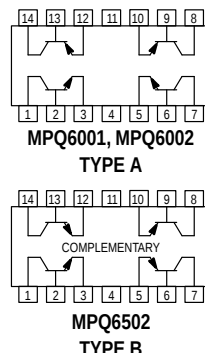


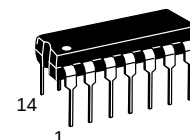
# Quad Complementary Pair Transistors

## NPN/PNP Silicon



**MPQ6001**  
**MPQ6002**  
**MPQ6502**

Voltage and current are negative  
for PNP transistors



CASE 646-06, STYLE 1  
TO-116

### MAXIMUM RATINGS

| Rating                                                                                                                                                        | Symbol         | Value           |                              | Unit                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------|------------------------------|----------------------|
| Collector–Emitter Voltage                                                                                                                                     | $V_{CEO}$      | 30              |                              | Vdc                  |
| Collector–Base Voltage                                                                                                                                        | $V_{CBO}$      | 60              |                              | Vdc                  |
| Emitter–Base Voltage                                                                                                                                          | $V_{EBO}$      | 5.0             |                              | Vdc                  |
| Collector Current — Continuous                                                                                                                                | $I_C$          | 500             |                              | mAdc                 |
|                                                                                                                                                               |                | Each Transistor | Four Transistors Equal Power |                      |
| Total Device Dissipation<br>@ $T_A = 25^\circ\text{C}$ (1)<br>MPQ6001, MPQ6002,<br>MPQ6502<br>Derate above $25^\circ\text{C}$<br>MPQ6001, MPQ6002,<br>MPQ6502 | $P_D$          | 0.65            | 1.25                         | Watts                |
|                                                                                                                                                               |                | 5.18            | 10                           | mW/ $^\circ\text{C}$ |
| Total Device Dissipation<br>@ $T_C = 25^\circ\text{C}$<br>MPQ6001, MPQ6002,<br>MPQ6502<br>Derate above $25^\circ\text{C}$<br>MPQ6001, MPQ6002,<br>MPQ6502     | $P_D$          | 1.0             | 3.0                          | Watts                |
|                                                                                                                                                               |                | 8.0             | 24                           | mW/ $^\circ\text{C}$ |
| Operating and Storage Junction Temperature Range                                                                                                              | $T_J, T_{stg}$ | –55 to +150     |                              | $^\circ\text{C}$     |

### THERMAL CHARACTERISTICS

| Characteristic     |                           | Junction to Case | Junction to Ambient | Unit                      |
|--------------------|---------------------------|------------------|---------------------|---------------------------|
| Thermal Resistance | Each Die                  | 125              | 193                 | $^\circ\text{C}/\text{W}$ |
|                    | Effective, 4 Die          | 41.6             | 100                 |                           |
| Coupling Factors   |                           |                  |                     | %                         |
| Q1–Q4 or Q2–Q3     | MPQ6001, MPQ6002, MPQ6502 | 30               | 60                  |                           |
| Q1–Q2 or Q3–Q4     | MPQ6001, MPQ6002, MPQ6502 | 20               | 24                  |                           |

1. Voltage and Current are negative for PNP devices.

## MPQ6001 MPQ6002 MPQ6502

### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| Characteristic                                                                             | Symbol        | Min | Typ | Max | Unit |
|--------------------------------------------------------------------------------------------|---------------|-----|-----|-----|------|
| <b>OFF CHARACTERISTICS</b>                                                                 |               |     |     |     |      |
| Collector–Emitter Breakdown Voltage <sup>(2)</sup><br>( $I_C = 10\text{ mA}$ , $I_B = 0$ ) | $V_{(BR)CEO}$ | 30  | —   | —   | Vdc  |
| Collector–Base Breakdown Voltage<br>( $I_C = 10\text{ }\mu\text{A}$ , $I_E = 0$ )          | $V_{(BR)CBO}$ | 60  | —   | —   | Vdc  |
| Emitter–Base Breakdown Voltage<br>( $I_E = 10\text{ }\mu\text{A}$ , $I_C = 0$ )            | $V_{(BR)EBO}$ | 5.0 | —   | —   | Vdc  |
| Collector Cutoff Current<br>( $V_{CB} = 50\text{ Vdc}$ , $I_E = 0$ )                       | $I_{CBO}$     | —   | —   | 30  | nAdc |
| Emitter Cutoff Current<br>( $V_{EB} = 3.0\text{ Vdc}$ , $I_C = 0$ )                        | $I_{EBO}$     | —   | —   | 30  | nAdc |

### ON CHARACTERISTICS

|                                                                                                                                                             |                             |               |           |        |            |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|---------------|-----------|--------|------------|-----|
| DC Current Gain <sup>(2)</sup><br>( $I_C = 1.0\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ )                                                                      | MPQ6001<br>MPQ6002, MPQ6502 | $h_{FE}$      | 25<br>50  | —<br>— | —<br>—     | —   |
| ( $I_C = 10\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ )                                                                                                         | MPQ6001<br>MPQ6002, MPQ6502 |               | 35<br>75  | —<br>— | —<br>—     |     |
| ( $I_C = 150\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ )                                                                                                        | MPQ6001<br>MPQ6002, MPQ6502 |               | 40<br>100 | —<br>— | —<br>—     |     |
| ( $I_C = 300\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ )                                                                                                        | MPQ6001<br>MPQ6002, MPQ6502 |               | 20<br>30  | —<br>— | —<br>—     |     |
| Collector–Emitter Saturation Voltage <sup>(2)</sup><br>( $I_C = 150\text{ mA}$ , $I_B = 15\text{ mA}$ )<br>( $I_C = 300\text{ mA}$ , $I_B = 30\text{ mA}$ ) |                             | $V_{CE(sat)}$ | —<br>—    | —<br>— | 0.4<br>1.4 | Vdc |
| Base–Emitter Saturation Voltage <sup>(2)</sup><br>( $I_C = 150\text{ mA}$ , $I_B = 15\text{ mA}$ )<br>( $I_C = 300\text{ mA}$ , $I_B = 30\text{ mA}$ )      |                             | $V_{BE(sat)}$ | —<br>—    | —<br>— | 1.3<br>2.0 | Vdc |

### SMALL–SIGNAL CHARACTERISTICS

|                                                                                                                               |            |           |        |            |            |     |
|-------------------------------------------------------------------------------------------------------------------------------|------------|-----------|--------|------------|------------|-----|
| Current–Gain — Bandwidth Product <sup>(2)</sup><br>( $I_C = 50\text{ mA}$ , $V_{CE} = 20\text{ Vdc}$ , $f = 100\text{ MHz}$ ) |            | $f_T$     | 200    | 350        | —          | MHz |
| Output Capacitance<br>( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )                                         | PNP<br>NPN | $C_{obo}$ | —<br>— | 6.0<br>4.5 | 8.0<br>8.0 | pF  |
| Input Capacitance<br>( $V_{EB} = 2.0\text{ Vdc}$ , $I_C = 0$ , $f = 1.0\text{ MHz}$ )                                         | PNP<br>NPN | $C_{ibo}$ | —<br>— | 20<br>17   | 30<br>30   | pF  |

### SWITCHING CHARACTERISTICS

|                                                                                                                                         |  |           |   |     |   |    |
|-----------------------------------------------------------------------------------------------------------------------------------------|--|-----------|---|-----|---|----|
| Turn–On Time<br>( $V_{CC} = 30\text{ Vdc}$ , $V_{EB} = 0.5\text{ Vdc}$ , $I_C = 150\text{ mA}$ ,<br>$I_{B1} = 15\text{ mA}$ , Figure 1) |  | $t_{on}$  | — | 30  | — | ns |
| Turn–Off Time<br>( $V_{CC} = 30\text{ Vdc}$ , $I_C = 150\text{ mA}$ ,<br>$I_{B1} = I_{B2} = 15\text{ mA}$ )                             |  | $t_{off}$ | — | 225 | — | ns |

2. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ ; Duty Cycle  $\leq 2.0\%$ .

## NPN DATA

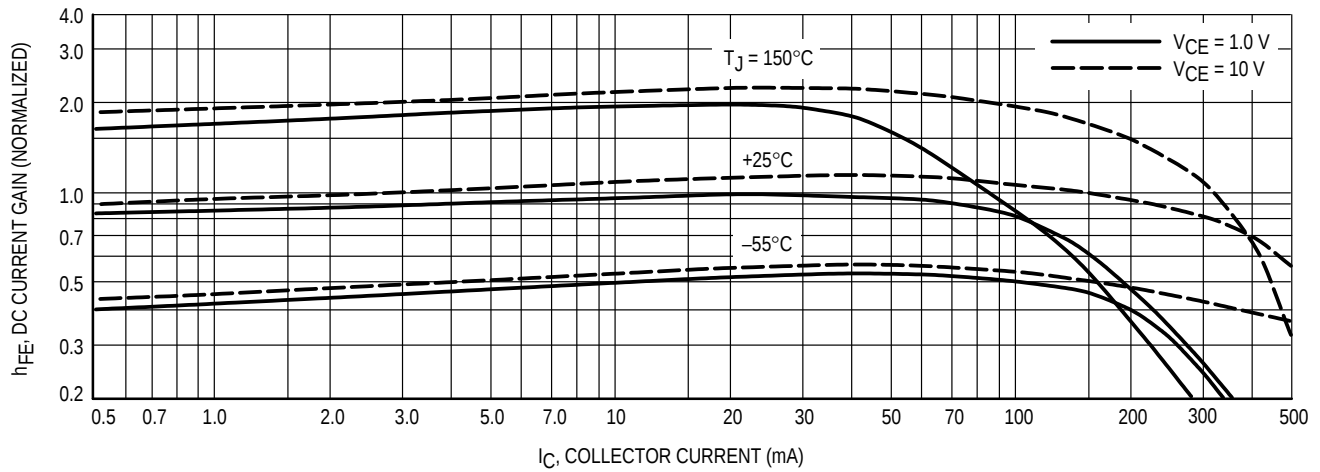


Figure 1. Normalized DC Current Gain

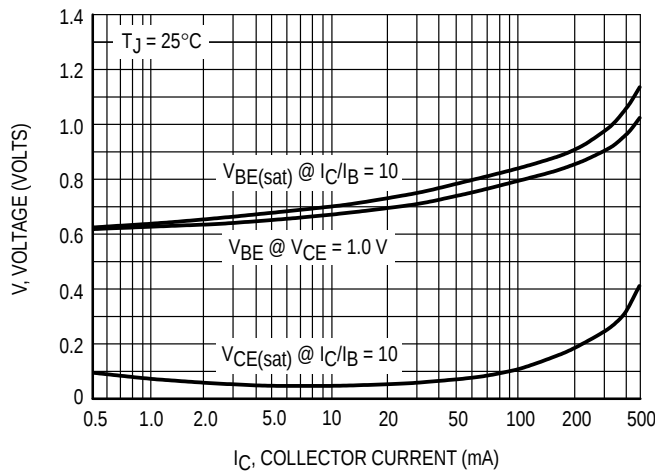


Figure 2. "ON" Voltages

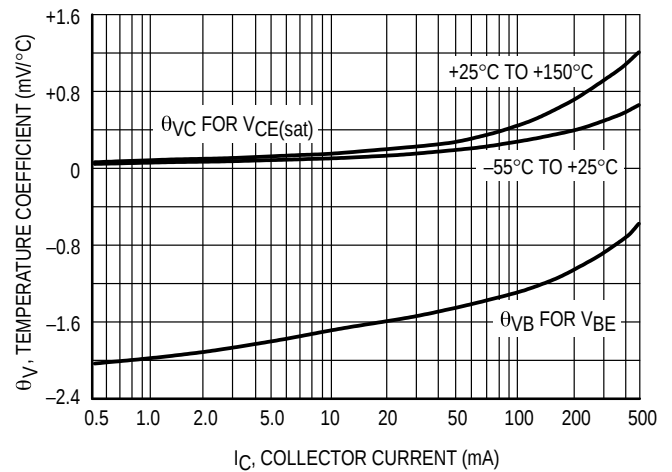


Figure 3. Temperature Coefficients

### NOISE FIGURE

( $V_{CE} = 10 \text{ Vdc}$ ,  $T_A = 25^\circ\text{C}$ )

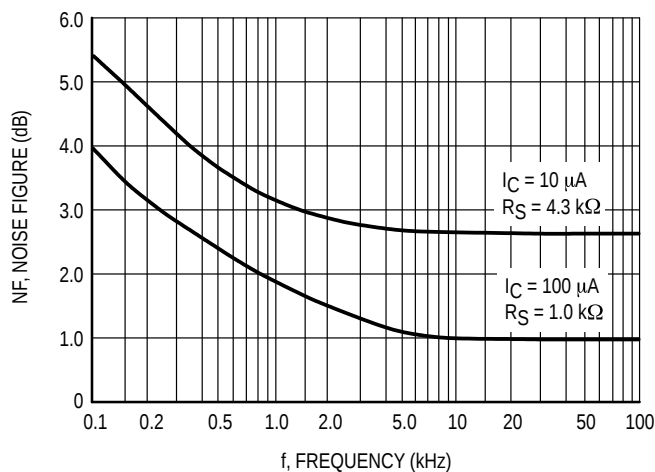


Figure 4. Frequency Effects

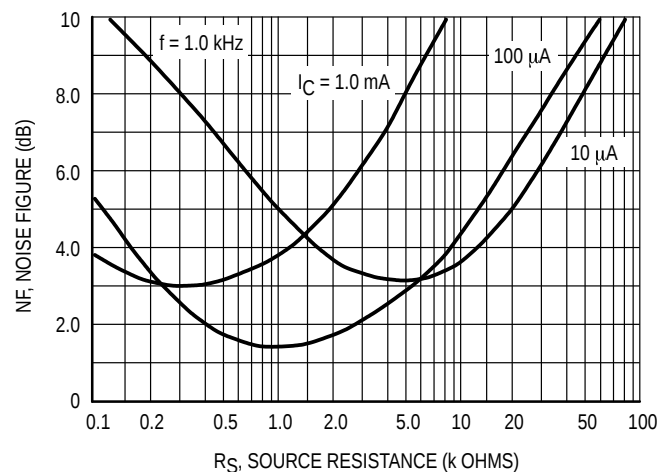
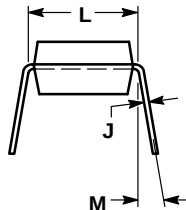
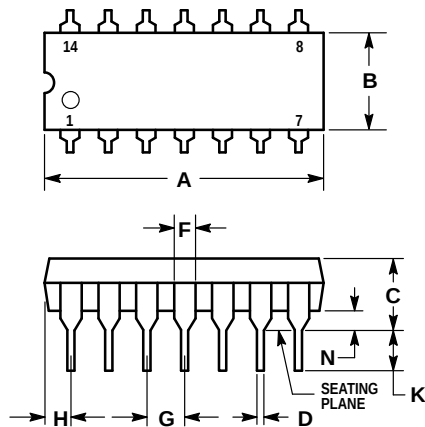


Figure 5. Source Resistance Effects

## PACKAGE DIMENSIONS



## STYLE 1:

- PIN 1. COLLECTOR  
 2. BASE  
 3. EMITTER  
 4. NO CONNECTION  
 5. EMITTER  
 6. BASE  
 7. COLLECTOR  
 8. COLLECTOR  
 9. BASE  
 10. EMITTER  
 11. NO CONNECTION  
 12. EMITTER  
 13. BASE  
 14. COLLECTOR

## NOTES:

- LEADS WITHIN 0.13 (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION.
- DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
- DIMENSION B DOES NOT INCLUDE MOLD FLASH.
- 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   | 0.300 BSC |       | 7.62 BSC    |       |
| M   | 0°        | 10°   | 0°          | 10°   |
| N   | 0.015     | 0.039 | 0.39        | 1.01  |

CASE 646-06  
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 ISSUE M

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