



**2N3724, 2N3725 — 2N4013, 2N4014 (continued)**

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

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

**ON CHARACTERISTICS (continued)**

|  |  |                 |     |      |     |
|--|--|-----------------|-----|------|-----|
| Collector-Emitter Saturation Voltage*<br>( $I_C = 10 \text{ mAdc}, I_B = 1.0 \text{ mAdc}$ ) | 2N3724, 2N4013<br>2N3725, 2N4014<br>2N3724, 2N4013<br>2N3725, 2N4014<br>2N3724, 2N4013<br>2N3725, 2N4014<br>2N3724, 2N4013<br>2N3725, 2N4014 | $V_{CE(sat)}$ * | -   | 0.25 | Vdc |
| ( $I_C = 100 \text{ mAdc}, I_B = 10 \text{ mAdc}$ )  |  |                 | -   | 0.20 |     |
| ( $I_C = 300 \text{ mAdc}, I_B = 30 \text{ mAdc}$ )  |  |                 | -   | 0.26 |     |
| ( $I_C = 500 \text{ mAdc}, I_B = 50 \text{ mAdc}$ )  |  |                 | -   | 0.32 |     |
| ( $I_C = 800 \text{ mAdc}, I_B = 80 \text{ mAdc}$ )  |  |                 | -   | 0.40 |     |
| ( $I_C = 1.0 \text{ Adc}, I_B = 100 \text{ mAdc}$ )  |  |                 | -   | 0.42 |     |
| ( $I_C = 1.0 \text{ Adc}, I_B = 100 \text{ mAdc}$ )  |  |                 | -   | 0.52 |     |
| Base-Emitter Saturation Voltage*<br>( $I_C = 10 \text{ mAdc}, I_B = 1.0 \text{ mAdc}$ )      | 2N3724, 2N4013<br>2N3725, 2N4014<br>2N3724, 2N4013<br>2N3725, 2N4014<br>2N3724, 2N4013<br>2N3725, 2N4014<br>2N3724, 2N4013<br>2N3725, 2N4014 | $V_{BE(sat)}$ * | -   | 0.76 | Vdc |
| ( $I_C = 100 \text{ mAdc}, I_B = 10 \text{ mAdc}$ )  |  |                 | -   | 0.86 |     |
| ( $I_C = 300 \text{ mAdc}, I_B = 30 \text{ mAdc}$ )  |  |                 | -   | 1.1  |     |
| ( $I_C = 500 \text{ mAdc}, I_B = 50 \text{ mAdc}$ )  |  |                 | 0.9 | 1.2  |     |
| ( $I_C = 800 \text{ mAdc}, I_B = 80 \text{ mAdc}$ )  |  |                 | -   | 1.5  |     |
| ( $I_C = 1.0 \text{ Adc}, I_B = 100 \text{ mAdc}$ )  |  |                 | -   | 1.7  |     |
| ( $I_C = 1.0 \text{ Adc}, I_B = 100 \text{ mAdc}$ )  |  |                 | -   | 0.95 |     |

**SMALL-SIGNAL CHARACTERISTICS**

|   |          |     |    |     |
|---|----------|-----|----|-----|
| Current-Gain-Bandwidth Product<br>( $I_C = 50 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}, f = 100 \text{ MHz}$ ) | $f_T$    | 300 | -  | MHz |
| Output Capacitance<br>( $V_{CB} = 10 \text{ Vdc}, I_E = 0, f = 140 \text{ kHz}$ )                           | $C_{ob}$ | -   | 12 | pF  |
|   |          | -   | 10 |     |
| Input Capacitance<br>( $V_{BE} = 0.5 \text{ Vdc}, I_C = 0, f = 140 \text{ kHz}$ )                           | $C_{ib}$ | -   | 55 | pF  |

**SWITCHING CHARACTERISTICS**

|               |  |           |   |    |    |
|---------------|--|-----------|---|----|----|
| Turn-On Time  | $(V_{CC} = 30 \text{ Vdc}, V_{BE(off)} = 3.8 \text{ Vdc}, I_C = 500 \text{ mAdc}, I_{B1} = 50 \text{ mAdc})$<br>(See Figure 1) | $t_{on}$  | - | 35 | ns |
| Delay Time    |  | $t_d$     | - | 10 | ns |
| Rise Time     |  | $t_r$     | - | 30 | ns |
| Turn-Off Time | $(V_{CC} = 30 \text{ Vdc}, I_C = 500 \text{ mAdc}, I_{B1} = I_{B2} = 50 \text{ mAdc})$<br>(See Figure 1)                       | $t_{off}$ | - | 60 | ns |
| Storage Time  |  | $t_s$     | - | 50 | ns |
| Fall Time     |  | $t_f$     | - | 25 | ns |
|               |  |           |   | 30 | ns |

\* Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle = 1.0%.

**FIGURE 1 — SWITCHING TIMES TEST CIRCUIT**

