



**— Switching and General Purpose Transistors —**

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

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

Characteristic	Symbol	Min	Max	Unit
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**ON CHARACTERISTICS (continued)**

Collector-Emitter Saturation Voltage* ( $I_C = 10 \text{ mA DC}$ , $I_B = 1.0 \text{ mA DC}$ ) ( $I_C = 100 \text{ mA DC}$ , $I_B = 10 \text{ mA DC}$ ) ( $I_C = 300 \text{ mA DC}$ , $I_B = 30 \text{ mA DC}$ ) ( $I_C = 500 \text{ mA DC}$ , $I_B = 50 \text{ mA DC}$ ) ( $I_C = 800 \text{ mA DC}$ , $I_B = 80 \text{ mA DC}$ ) ( $I_C = 1.0 \text{ A DC}$ , $I_B = 100 \text{ mA DC}$ )	$V_{CE(\text{sat})}^*$	-	0.25 0.20 0.26 0.32 0.40 0.42 0.52 0.65 0.80 0.75 0.95	Vdc
Base-Emitter Saturation Voltage* ( $I_C = 10 \text{ mA DC}$ , $I_B = 1.0 \text{ mA DC}$ ) ( $I_C = 100 \text{ mA DC}$ , $I_B = 10 \text{ mA DC}$ ) ( $I_C = 300 \text{ mA DC}$ , $I_B = 30 \text{ mA DC}$ ) ( $I_C = 500 \text{ mA DC}$ , $I_B = 50 \text{ mA DC}$ ) ( $I_C = 800 \text{ mA DC}$ , $I_B = 80 \text{ mA DC}$ ) ( $I_C = 1.0 \text{ A DC}$ , $I_B = 100 \text{ mA DC}$ )	$V_{BE(\text{sat})}^*$	-	0.76 0.86 1.1 0.9 1.2 1.5 1.7	Vdc

**SMALL-SIGNAL CHARACTERISTICS**

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

**SWITCHING CHARACTERISTICS**

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

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

**FIGURE 1 – SWITCHING TIMES TEST CIRCUIT**

