

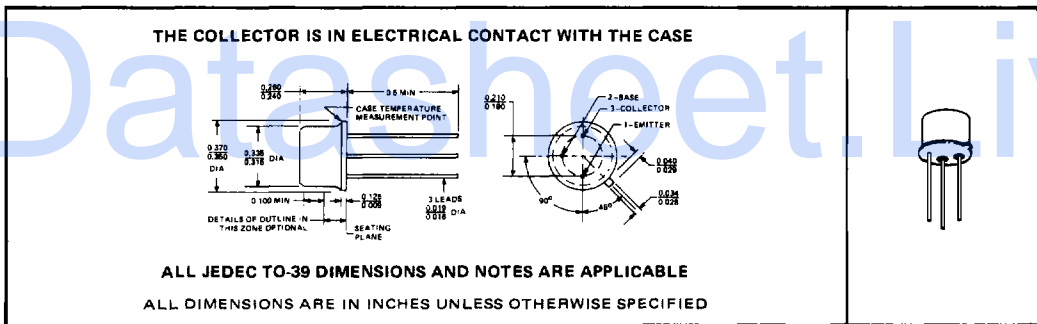
# TYPES 2N3724, 2N3724A, 2N3725, 2N3725A N-P-N SILICON TRANSISTORS

BULLETIN NO. DLS 7310081, JUNE 1967—REVISED MARCH 1973

FAST, HIGH-VOLTAGE, HIGH-CURRENT CORE DRIVERS

- hFE Guaranteed from 10 mA to 1.5 A
- Guaranteed Switching Times at One Ampere (2N3724A, 2N3725A)

**\*mechanical data**



**absolute maximum ratings at 25°C free-air temperature (unless otherwise noted)**

	2N3724	2N3724A	2N3725	2N3725A	UNIT
Collector-Base Voltage		50*		80*	V
Collector-Emitter Voltage (See Note 1)		30*		50*	V
Emitter-Base Voltage		6*		6*	V
Continuous Collector Current	0.5*	1.2*	0.5*	1.2*	A
Peak Collector Current (See Note 2)		1.75*		1.75*	A
Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 3)	0.8*	1*	0.8*	1*	W
Continuous Device Dissipation at (or below) 25°C Case Temperature (See Note 4)	10† 3.5*	10† 5*	10† 3.5*	10† 5*	W
Storage Temperature Range		-65 to 200*		-65 to 200*	°C
Lead Temperature 1/16 Inch from Case for 60 Seconds		300*		300*	°C

- NOTES: 1. These values apply between 0.01 mA and 500 mA collector current when the base-emitter diode is open-circuited.  
 2. This value applies for square-wave pulses.  $t_p = 300 \mu s$ , duty cycle  $\leq 2\%$ .  
 3. For the 2N3724 and 2N3725, derate linearly to 200°C free-air temperature at the rate of 4.57 mW/°C. For the 2N3724A and 2N3725A, derate linearly to 200°C free-air temperature at the rate of 5.71 mW/°C.  
 4. Derate the 10-watt rating linearly to 200°C case temperature at the rate of 57.1 mW/°C. Derate the JEDEC registered ratings linearly to 200°C case temperature at the rates of 20 mW/°C for the 2N3724 and 2N3725 and 28.6 mW/°C for the 2N3724A and 2N3725A.

\*JEDEC registered data. This data sheet contains all applicable registered data in effect at the time of publication.

USES CHIP N13

# TYPES 2N3724, 2N3724A, 2N3725, 2N3725A N-P-N SILICON TRANSISTORS

\*electrical characteristics at 25°C free-air temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS	2N3724		2N3724A		2N3725		2N3725A		UNIT	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX		
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage $I_C = 10 \mu A, I_E = 0$	50		50		80		80		V	
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage $I_C = 10 \text{ mA}, I_B = 0$ , See Note 5	30		30		50		50		V	
$V_{(BR)CES}$	Collector-Emitter Breakdown Voltage $I_C = 10 \mu A, V_{BE} = 0$	50		50		80		80		V	
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage $I_E = 10 \mu A, I_C = 0$	6		6		6		6		V	
$I_{CBO}$	Collector Cutoff Current $V_{CB} = 40 \text{ V}, I_E = 0$	$I_E = 0, T_A = 100^\circ\text{C}$	1.7		0.5					$\mu A$	
		$I_E = 0, T_A = 100^\circ\text{C}$	120		50					$\mu A$	
		$I_E = 0, T_A = 100^\circ\text{C}$					1.7		0.5		$\mu A$
		$I_E = 0, T_A = 100^\circ\text{C}$					120		50		$\mu A$
$I_{CES}$	Collector Cutoff Current $V_{CE} = 50 \text{ V}, V_{BE} = 0$	$V_{BE} = 0$	10		10					$\mu A$	
		$V_{BE} = 0$					10		10	$\mu A$	
$I_B$	Base Current $V_{CE} = 50 \text{ V}, V_{BE} = 0$	$V_{BE} = 0$	-10		-10					$\mu A$	
		$V_{BE} = 0$					-10		-10	$\mu A$	
$h_{FE}$	Static Forward Current Transfer Ratio $V_{CE} = 1 \text{ V}, I_C = 10 \text{ mA}$	$I_C = 100 \text{ mA}$	30		30		30		30		
		$I_C = 100 \text{ mA}$	60	150	60	150	60	150	60	150	
		$I_C = 100 \text{ mA}, T_A = -55^\circ\text{C}$	30		30		30		30		
		$I_C = 300 \text{ mA}$	40		40		40		40		
		$I_C = 500 \text{ mA}$	35		35		35		35		
		$I_C = 500 \text{ mA}, T_A = -55^\circ\text{C}$	20		20		20		20		
		$I_C = 800 \text{ mA}$	25		30		20		25		
		$I_C = 1 \text{ A}$	30		30		25		25		
$V_{BE}$	Base-Emitter Voltage $I_B = 1 \text{ mA}, I_C = 10 \text{ mA}$	$I_C = 100 \text{ mA}$	0.76		0.76		0.76		0.76	V	
		$I_C = 100 \text{ mA}$	0.86		0.86		0.86		0.86	V	
		$I_C = 300 \text{ mA}$	1.1		1		1.1		1	V	
		$I_C = 500 \text{ mA}$	0.8	1.1	0.8	1.1	0.8	1.1	0.8	1.1	V
		$I_C = 800 \text{ mA}$	1.5		1.3		1.5		1.3		V
		$I_C = 1 \text{ A}$	1.7		0.9	1.4	1.7		0.9	1.4	V
		$I_C = 1 \text{ A}$	0.75		0.75		0.95		0.9		V
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage $I_B = 1 \text{ mA}, I_C = 10 \text{ mA}$	$I_C = 100 \text{ mA}$	0.25		0.25		0.25		0.25	V	
		$I_C = 100 \text{ mA}$	0.2		0.2		0.26		0.26	V	
		$I_C = 300 \text{ mA}$	0.32		0.32		0.4		0.4	V	
		$I_C = 500 \text{ mA}$	0.42		0.42		0.52		0.52	V	
		$I_C = 800 \text{ mA}$	0.65		0.65		0.8		0.8	V	
		$I_C = 1 \text{ A}$	0.75		0.75		0.95		0.9	V	
$ h_{fe} $	Small-Signal Common-Emitter Forward Current Transfer Ratio $V_{CE} = 10 \text{ V}, I_C = 50 \text{ mA}, f = 100 \text{ MHz}$	3		3		3		3			
$C_{obo}$	Common-Base Open-Circuit Output Capacitance $V_{CB} = 10 \text{ V}, I_E = 0, f = 1 \text{ MHz}$	12		12		10		10	pF		
$C_{ibo}$	Common-Base Open-Circuit Input Capacitance $V_{EB} = 0.5 \text{ V}, I_C = 0, f = 1 \text{ MHz}$	55		55		55		55	pF		

NOTE 5: These parameters must be measured using pulse techniques:  $t_p = 300 \mu s$ , duty cycle  $\leq 1\%$ .

\* JEDEC registered data

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# TYPES 2N3724, 2N3724A, 2N3725, 2N3725A

## N-P-N SILICON TRANSISTORS

\*switching characteristics at 25°C free-air temperature

PARAMETER	TEST CONDITIONS†	2N3724	2N3724A	2N3725	2N3725A	UNIT
		MAX	MAX	MAX	MAX	
$t_d$ Delay Time	$I_C = 500 \text{ mA}$ ,	10	10	10	10	ns
$t_r$ Rise Time	$I_{B(1)} = 50 \text{ mA}$ , $V_{BE(off)} = -3.8 \text{ V}$ ,	30	30	30	30	ns
$t_{on}$ Turn-On Time	$R_L = 58 \Omega$ , See Figure 1	35	35	35	35	ns
$t_s$ Storage Time	$I_C = 500 \text{ mA}$ ,	50	50	50	50	ns
$t_f$ Fall Time	$I_{B(1)} = 50 \text{ mA}$ , $I_{B(2)} = -50 \text{ mA}$ ,	25	25	30	30	ns
$t_{off}$ Turn-Off Time	$R_L = 58 \Omega$ , See Figure 1	60	60	60	60	ns
$t_{on}$ Turn-On Time	$I_C = 1 \text{ A}$ , $I_{B(1)} = 100 \text{ mA}$ , $V_{BE(off)} = -2 \text{ V}$ , $R_L = 30 \Omega$ , See Figure 2		30		30	ns
$t_{off}$ Turn-Off Time	$I_C = 1 \text{ A}$ , $I_{B(1)} = 100 \text{ mA}$ , $I_{B(2)} = -100 \text{ mA}$ , $R_L = 30 \Omega$ , See Figure 3		50		50	ns

†Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.

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### \*PARAMETER MEASUREMENT INFORMATION

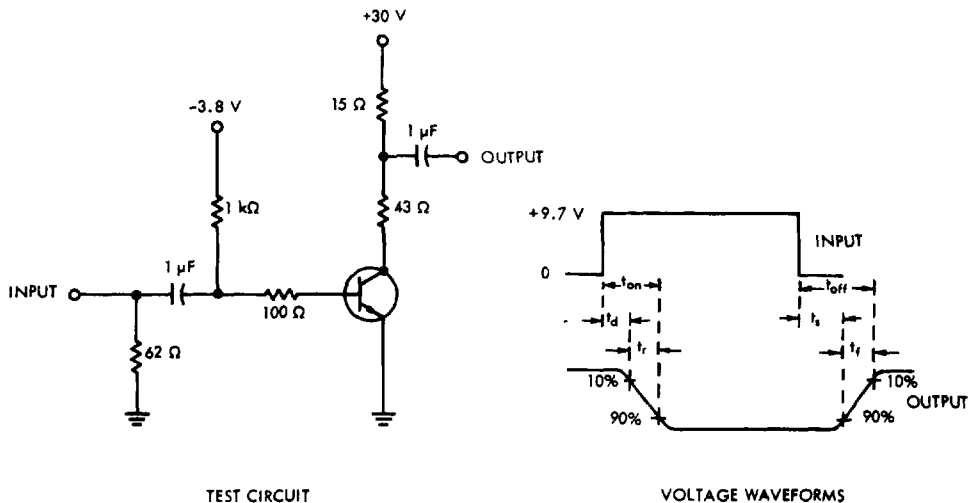


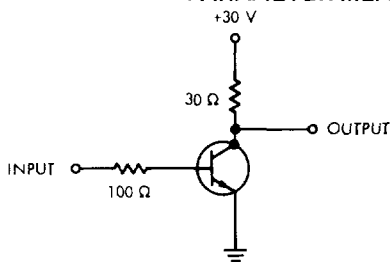
FIGURE 1 — 500-mA SWITCHING TIMES

NOTES: a. The input waveforms are supplied by a generator with the following characteristics:  $Z_{out} = 50 \Omega$ ,  $t_r \leq 1 \text{ ns}$ ,  $t_f \leq 1 \text{ ns}$ ,  $t_p \approx 1 \mu\text{s}$ , duty cycle  $\leq 2\%$ .  
b. The waveforms are monitored on an oscilloscope with the following characteristics:  $t_r \leq 1 \text{ ns}$ ,  $R_{in} \geq 100 \text{ k}\Omega$ ,  $C_{in} \leq 7 \text{ pF}$ .

\* JEDEC registered data

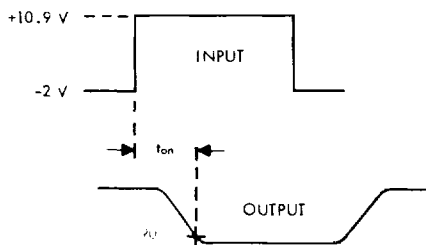
# TYPES 2N3724, 2N3724A, 2N3725, 2N3725A N-P-N SILICON TRANSISTORS

## \*PARAMETER MEASUREMENT INFORMATION

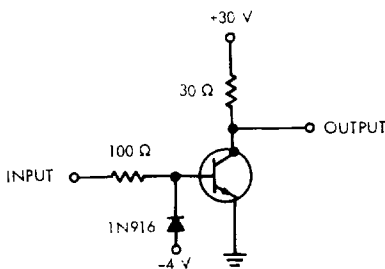


TEST CIRCUIT

FIGURE 2 — 1-AMPERE TURN-ON TIME (2N3724A AND 2N3725A)

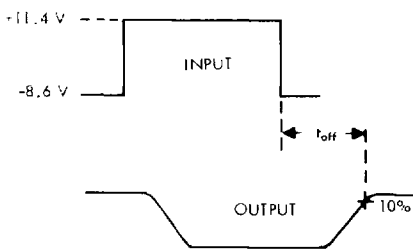


VOLTAGE WAVEFORMS



TEST CIRCUIT

FIGURE 3 — 1-AMPERE TURN-OFF TIME (2N3724A AND 2N3725A)



VOLTAGE WAVEFORMS

NOTES a The input waveforms have the following characteristics

For measuring turn-on time  $t_r \leq 2$  ns,  $t_p = 200$  ns, duty cycle  $\leq 2\%$

For measuring turn-off time  $t_f \leq 3$  ns,  $t_p = 200$  ns to 10  $\mu$ s, duty cycle  $\leq 2\%$

b The output waveforms are monitored on an oscilloscope with the following characteristics  $t_r \leq 1$  ns,  $R_{in} \leq 100$  k $\Omega$ ,  $C_{in} \leq 7$  pF.

\*Indicates JEDEC registered data

## THERMAL INFORMATION

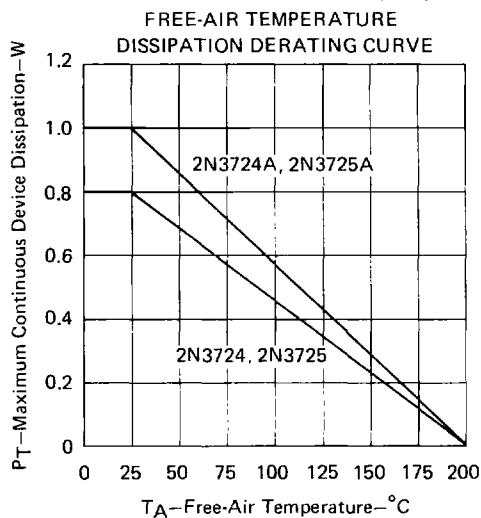


FIGURE 4

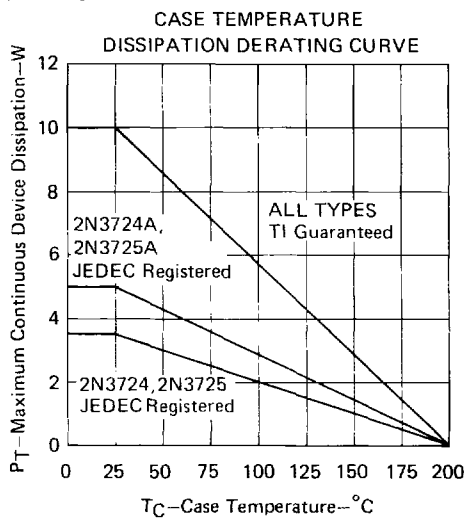


FIGURE 5