

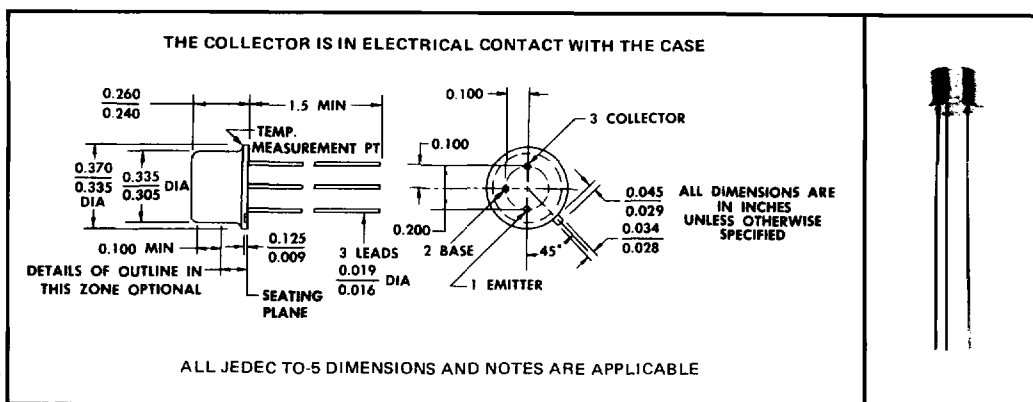
# TYPES 2N3719, 2N3720 P-N-P SILICON POWER TRANSISTORS

FOR POWER-AMPLIFIER AND HIGH-SPEED-SWITCHING APPLICATIONS  
DESIGNED FOR COMPLEMENTARY USE WITH TIP501, TIP502

TYPES 2N3719, 2N3720  
BULLETIN NO. DLS-7111606, DECEMBER 1971

- Max  $t_{off}$  of 0.4  $\mu$ s at  $I_C = 1$  A
- 3-A Rated Continuous Collector Current
- 6 Watts at 25°C Case Temperature
- Min  $f_T$  of 60 MHz at 10 V, 0.5 A

\*mechanical data



5

absolute maximum ratings at 25°C case temperature (unless otherwise noted)

	2N3719	2N3720
* Collector-Base Voltage	-40 V	-60 V
* Collector-Emitter Voltage (See Note 1)	-40 V	-60 V
* Emitter-Base Voltage	-4 V	-4 V
* Continuous Collector Current	← -3 A →	← -3 A →
* Peak Collector Current (See Note 2)	← -10 A →	← -10 A →
* Continuous Base Current	← -0.5 A →	← -0.5 A →
* Safe Operating Areas at (or below) 25°C Case Temperature	See Figures 3 and 4	
* Continuous Device Dissipation at (or below) 25°C Case Temperature (See Note 3)	← 6 W →	← 6 W →
* Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 4)	← 1 W →	← 1 W →
* Operating Collector Junction Temperature Range	-65°C to 200°C	-65°C to 200°C
* Storage Temperature Range	-65°C to 200°C	-65°C to 200°C
* Lead Temperature 1/16 Inch from Case for 10 Seconds	← 300°C →	← 300°C →

- NOTES: 1. These values apply when the base-emitter diode is open-circuited.  
 2. This value applies for  $t_{W} \leq 0.5$  ms, duty cycle  $\leq 10\%$ .  
 3. Derate linearly to 200°C case temperature at the rate of 34.3 mW/°C or refer to Dissipation Derating Curve, Figure 5.  
 4. Derate linearly to 200°C free-air temperature at the rate of 5.71 mW/°C or refer to Dissipation Derating Curve, Figure 6.

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

# TYPES 2N3719, 2N3720

## P-N-P SILICON POWER TRANSISTORS

\*electrical characteristics at 25°C case temperature (unless otherwise noted)

PARAMETER	TEST CONDITIONS	2N3719		2N3720		UNIT
		MIN	MAX	MIN	MAX	
V <sub>(BR)CEO</sub> Collector-Emitter Breakdown Voltage	I <sub>C</sub> = -20 mA, I <sub>B</sub> = 0, See Note 5	-40		-60		V
I <sub>CEV</sub> Collector Cutoff Current	V <sub>CE</sub> = -40 V, V <sub>BE</sub> = 2 V		-10			μA
	V <sub>CE</sub> = -60 V, V <sub>BE</sub> = 2 V			-10		
	V <sub>CE</sub> = -40 V, V <sub>BE</sub> = 2 V, T <sub>C</sub> = 150°C		-1			mA
	V <sub>CE</sub> = -60 V, V <sub>BE</sub> = 2 V, T <sub>C</sub> = 150°C			-1		
I <sub>CBO</sub> Collector Cutoff Current	V <sub>CB</sub> = -40 V, I <sub>E</sub> = 0		-10			μA
	V <sub>CB</sub> = -60 V, I <sub>E</sub> = 0			-10		
I <sub>EBO</sub> Emitter Cutoff Current	V <sub>EB</sub> = -4 V, I <sub>C</sub> = 0		-1	-1		mA
h <sub>FE</sub> Static Forward Current Transfer Ratio	V <sub>CE</sub> = -1.5 V, I <sub>C</sub> = -0.5 A	20		20		
	V <sub>CE</sub> = -1.5 V, I <sub>C</sub> = -1 A	25	180	25	180	
	V <sub>CE</sub> = -1.5 V, I <sub>C</sub> = -1 A, T <sub>C</sub> = -40°C	15		15		
V <sub>BE</sub> Base-Emitter Voltage	I <sub>B</sub> = -100 mA, I <sub>C</sub> = -1 A, T <sub>C</sub> = -40°C to 100°C		-1.5		-1.5	V
	I <sub>B</sub> = -300 mA, I <sub>C</sub> = -3 A, T <sub>C</sub> = -40°C to 100°C		-2.3		-2.3	
V <sub>CE(sat)</sub> Collector-Emitter Saturation Voltage	I <sub>B</sub> = -100 mA, I <sub>C</sub> = -1 A, T <sub>C</sub> = -40°C to 100°C		-0.75		-0.75	V
	I <sub>B</sub> = -300 mA, I <sub>C</sub> = -3 A, T <sub>C</sub> = -40°C to 100°C		-1.5		-1.5	
h <sub>fe</sub>   Small-Signal Common-Emitter Forward Current Transfer Ratio	V <sub>CE</sub> = -10 V, I <sub>C</sub> = -0.5 A, f = 30 MHz	2		2		
C <sub>obo</sub> Common-Base Open-Circuit Output Capacitance	V <sub>CB</sub> = -10 V, I <sub>E</sub> = 0, f = 100 kHz	120		120		pF
C <sub>ibo</sub> Common-Base Open-Circuit Input Capacitance	V <sub>EB</sub> = -0.5 V, I <sub>C</sub> = 0, f = 100 kHz	1000		1000		pF

NOTES: 5. These parameters must be measured using pulse techniques. t<sub>w</sub> = 300 μs, duty cycle ≤ 2%.

6. These parameters are measured with voltage-sensing contacts separate from the current-carrying contacts and located within 0.125 inch from the device body.

\*switching characteristics at 25°C case temperature

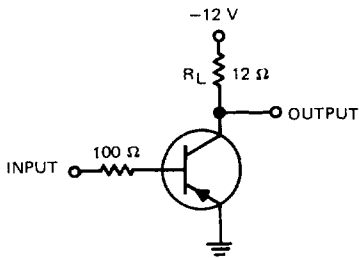
PARAMETER	TEST CONDITIONS†	MAX	UNIT
t <sub>on</sub> Turn-On Time	I <sub>C</sub> = -1 A, I <sub>B</sub> (1) = -0.1 A, V <sub>BE(off)</sub> = 4 V, R <sub>L</sub> = 12 Ω, See Figure 1	0.1	μs
t <sub>off</sub> Turn-Off Time	I <sub>C</sub> = -1 A, I <sub>B</sub> (1) = -0.1 A, I <sub>B</sub> (2) = 0.1 A, R <sub>L</sub> = 12 Ω, See Figure 2	0.4	

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

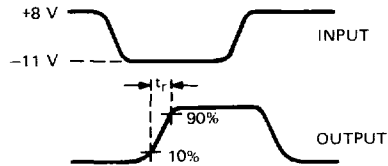
\*JEDEC registered data

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## \*PARAMETER MEASUREMENT INFORMATION



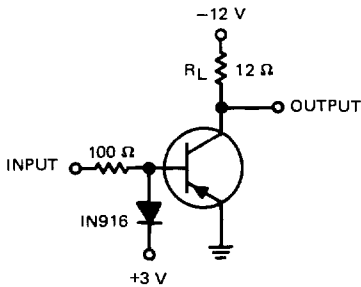
TEST CIRCUIT



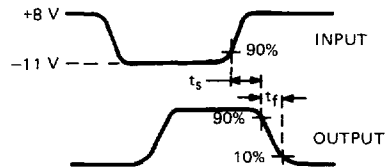
VOLTAGE WAVEFORMS

FIGURE 1—TURN-ON TIME

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TEST CIRCUIT



VOLTAGE WAVEFORMS

FIGURE 2—TURN-OFF TIME

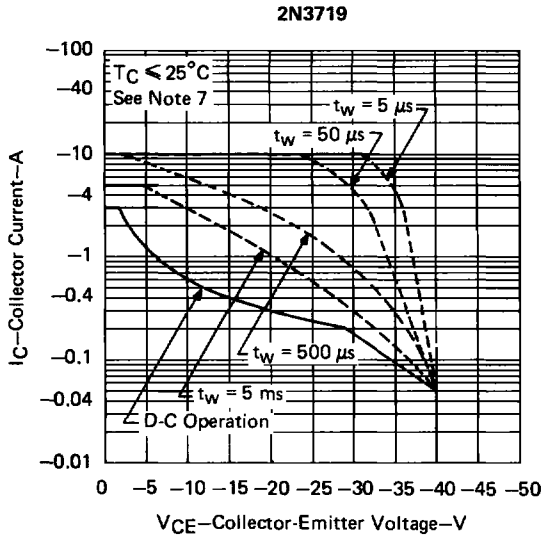
- NOTES:
- The input waveforms are supplied by a generator with the following characteristics:  $t_r \leq 10$  ns,  $t_f \leq 10$  ns,  $Z_{out} = 50$   $\Omega$ ,  $t_w = 10$   $\mu$ s, duty cycle  $\leq 2\%$ .
  - Waveforms are monitored on an oscilloscope with the following characteristics:  $t_r \leq 5$  ns,  $R_{in} \geq 10$  k $\Omega$ ,  $C_{in} \leq 11.5$  pF.
  - Resistors must be noninductive types.
  - The d-c power supplies may require additional bypassing in order to minimize ringing.

\* JEDEC registered data

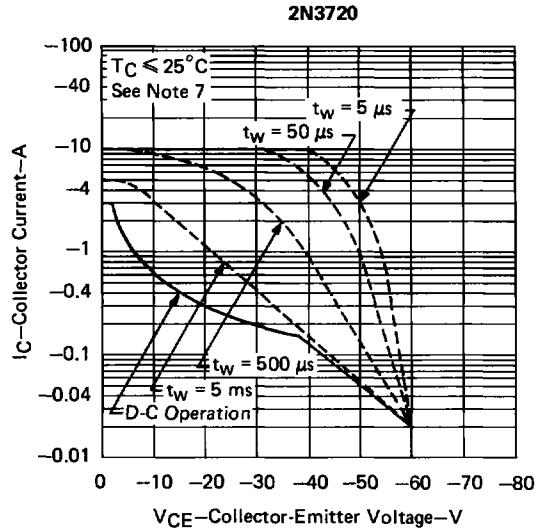
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## P-N-P SILICON POWER TRANSISTORS

### MAXIMUM SAFE OPERATING AREAS



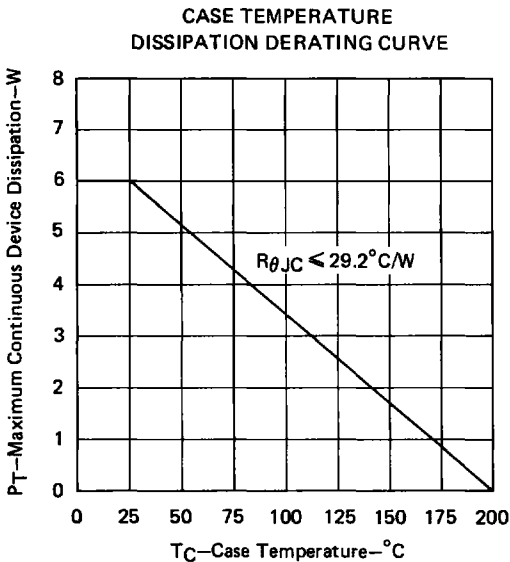
**FIGURE 3**



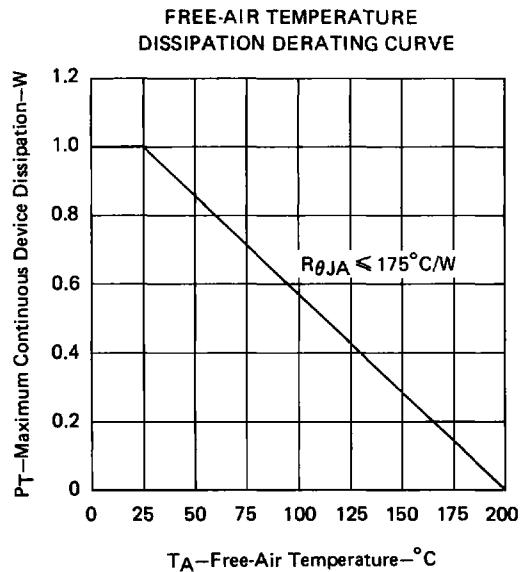
**FIGURE 4**

**NOTE 7:** Areas defined by dashed lines apply for nonrepetitive-pulse operation. The pulse may be repeated after the device has regained thermal equilibrium.

### THERMAL INFORMATION



**FIGURE 5**



**FIGURE 6**