

TYPES 2N3905, 2N3906, A5T3905, A5T3906 P-N-P SILICON TRANSISTORS

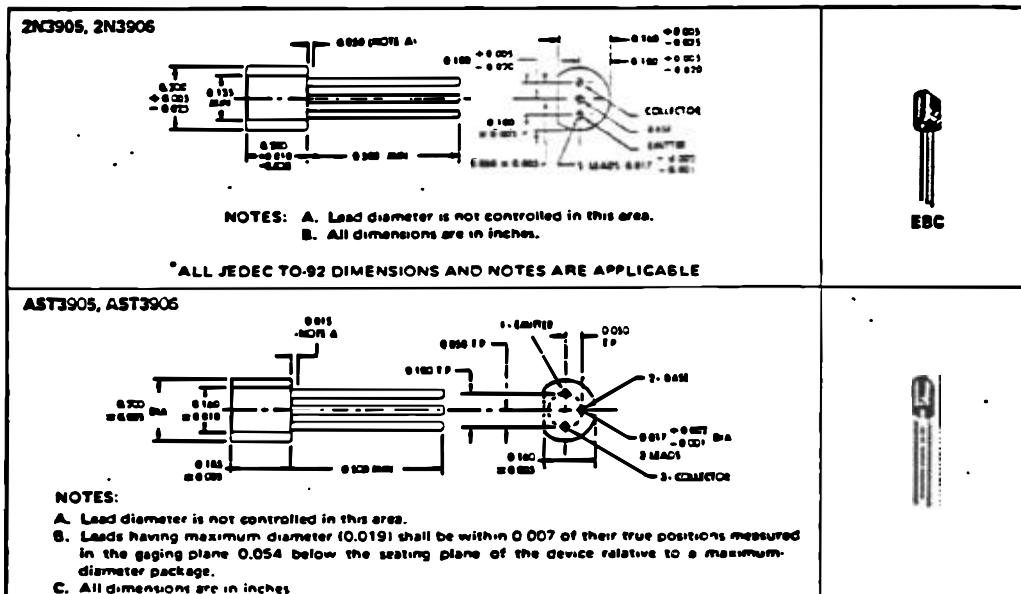
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SILECT† TRANSISTORS‡ FOR GENERAL PURPOSE SATURATED SWITCHING AND AMPLIFIER APPLICATIONS

- For Complementary Use with N-P-N Types 2N3903, 2N3904, A5T3903, and A5T3904
- Rugged One-Piece Construction with In-Line Leads or Standard TO-18 100-mil Pin-Circle Configuration

mechanical data

These transistors are encapsulated in a plastic compound specifically designed for this purpose, using a highly mechanized process developed by Texas Instruments. The case will withstand soldering temperatures without deformation. These devices exhibit stable characteristics under high-humidity conditions and are capable of meeting MIL-STD-202C, Method 106B. The transistors are insensitive to light.



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

Collector-Base Voltage	-40 V*				
Collector-Emitter Voltage (See Note 1)	-40 V*				
Emitter-Base Voltage	-5 V*				
Continuous Collector Current	-200 mA*				
Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 2)	<table style="display: inline-table; border: none;"> <tr> <td style="font-size: 2em; vertical-align: middle;">{</td> <td style="padding-left: 5px;">625 mW[§]</td> </tr> <tr> <td style="font-size: 2em; vertical-align: middle;">}</td> <td style="padding-left: 5px;">310 mW*</td> </tr> </table>	{	625 mW [§]	}	310 mW*
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Storage Temperature Range	<table style="display: inline-table; border: none;"> <tr> <td style="font-size: 2em; vertical-align: middle;">{</td> <td style="padding-left: 5px;">-65°C to 150°C[§]</td> </tr> <tr> <td style="font-size: 2em; vertical-align: middle;">}</td> <td style="padding-left: 5px;">-55°C to 135°C*</td> </tr> </table>	{	-65°C to 150°C [§]	}	-55°C to 135°C*
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}	-55°C to 135°C*				
Lead Temperature 1/16 Inch from Case for 60 Seconds	<table style="display: inline-table; border: none;"> <tr> <td style="font-size: 2em; vertical-align: middle;">{</td> <td style="padding-left: 5px;">260°C[§]</td> </tr> <tr> <td style="font-size: 2em; vertical-align: middle;">}</td> <td style="padding-left: 5px;">230°C*</td> </tr> </table>	{	260°C [§]	}	230°C*
{	260°C [§]				
}	230°C*				

NOTES: 1. This value applies between 10 µA and 200 mA collector current when the base-emitter diode is open-circuited.
2. Derate the 625-mW rating linearly to 150°C free air temperature at the rate of 5 mW/°C. Derate the 310-mW (JEDEC registered) rating linearly to 135°C free-air temperature at the rate of 2.81 mW/°C.

*The asterisk identifies JEDEC registered data for the 2N3905 and 2N3906 only. This data sheet contains all applicable registered data in effect at the time of publication.

†Trademark of Texas Instruments

‡U.S. Patent No. 3,439,238

§Texas Instruments guarantees these values in addition to the JEDEC registered values which are also shown.

USES CHIP P15

TYPES 2N3905, 2N3906, A5T3905, A5T3906
P-N-P SILICON TRANSISTORS

*Electrical characteristics at 25°C free-air temperature

PARAMETER	TEST CONDITIONS	2N3905		2N3906		UNIT	
		A5T3905	A5T3906	MIN	MAX		
V _{BR} (CBO)	Collector-Base Breakdown Voltage I _C = -10 μA, I _E = 0	-40	-40			V	
V _{BR} (CEO)	Collector-Emitter Breakdown Voltage I _C = -1 mA, I _B = 0, See Note 3	-40	-40			V	
V _{BR} (EBO)	Emitter-Base Breakdown Voltage I _E = -10 μA, I _C = 0	-5	-5			V	
I _{CEV}	Collector Cutoff Current V _{CE} = -30 V, V _{BE} = 3 V	-50	-50			nA	
I _{BEV}	Base Cutoff Current V _{CE} = -30 V, V _{BE} = 3 V	50	50			nA	
h _{FE}	Static Forward Current Transfer Ratio V _{CE} = -1 V, I _C = -100 μA	30	60				
		V _{CE} = -1 V, I _C = -1 mA	40	80			
		V _{CE} = -1 V, I _C = -10 mA	50	150	100	300	
		V _{CE} = -1 V, I _C = -50 mA	30	60			
		V _{CE} = -1 V, I _C = -100 mA	15	30			
V _{BE}	Base-Emitter Voltage I _B = -1 mA, I _C = -10 mA	See Note 3	-0.65	-0.85	-0.65	-0.85	V
		I _B = -5 mA, I _C = -50 mA		-0.95		-0.95	
V _{CE(sat)}	Collector-Emitter Saturation Voltage I _B = -1 mA, I _C = -10 mA	See Note 3	-0.25		-0.25		V
		I _B = -5 mA, I _C = -50 mA		-0.4		-0.4	
r _{in}	Small-Signal Common-Emitter Input Impedance V _{CE} = -10 V, I _C = -1 mA, f = 1 kHz	0.5	8	2	12	kΩ	
h _{fe}	Small-Signal Common-Emitter Forward Current Transfer Ratio	50	200	100	400		
r _{re}	Small-Signal Common-Emitter Reverse Voltage Transfer Ratio	0.1 × 10 ⁻⁴	5 × 10 ⁻⁴	0.1 × 10 ⁻⁴	10 × 10 ⁻⁴		
r _{oe}	Small-Signal Common-Emitter Output Admittance	1	40	3	60	μmho	
h _{fe}	Small-Signal Common-Emitter Forward Current Transfer Ratio V _{CE} = -20 V, I _C = -10 mA, f = 100 MHz	2		2.5			
f _T	Transition Frequency V _{CE} = -20 V, I _C = -10 mA, See Note 4	200		250		MHz	
C _{obo}	Common-Base Open-Circuit Output Capacitance V _{CB} = -5 V, I _E = 0, f = 100 kHz to 1 MHz		4.5		4.5	pF	
C _{ibo}	Common-Base Open-Circuit Input Capacitance V _{EB} = -0.5 V, I _C = 0, f = 100 kHz to 1 MHz		10		10	pF	

NOTES 3. These parameters must be measured using pulse techniques. t_w = 300 μs, duty cycle < 2%.

4. To obtain f_T, the |h_{fe}| response is extrapolated at the rate of -6 dB per octave from f = 100 MHz to the frequency at which |h_{fe}| = 1.

*Operating characteristics at 25°C free-air temperature

PARAMETER	TEST CONDITIONS	2N3905		2N3906		UNIT
		A5T3905	A5T3906	MIN	MAX	
NF	Average Noise Figure V _{CE} = -5 V, I _C = -100 μA, R _G = 1 kΩ, Noise Bandwidth = 15.7 kHz, See Note 5	5		4		dB

NOTE 5: Average Noise Figure is measured in an amplifier with response down 3 dB at 10 Hz and 10 kHz and a high-frequency rolloff of 6 dB/octave.

*The asterisk identifies JEDEC registered data for the 2N3905 and 2N3906 only.

TEXAS INSTRUMENTS
INCORPORATED
POST OFFICE BOX 5012 • DALLAS, TEXAS 75222

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