

SEMICONDUCTOR TECHNICAL DATA

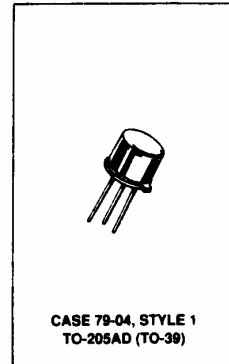
**2N2904,
2N2904A,
2N2905
2N2905A**

**PNP Silicon
Small-Signal Transistors**

CRYSTALONCS
2805 Veterans Highway
Suite 14
Ronkonkoma, N.Y. 11779

... designed for high-speed switching and DC to VHF amplifier applications.

MAXIMUM RATINGS				
Rating	Symbol	2N2904 2N2905	2N2904A 2N2905A	Unit
Collector-Emitter Voltage	V _{CEO}	40	60	V _{dc}
Collector-Base Voltage	V _{CBO}	60		V _{dc}
Emitter-Base Voltage	V _{EBO}	5.0		V _{dc}
Collector Current — Continuous	I _C	600		mAdc
Total Device Dissipation	P _T			Watts
@ T _A = 25°C		0.6		mW/°C
Derate above 25°C		3.43		Watts
@ T _C = 25°C		3.0		mW/°C
Derate above 25°C		17.2		
Operating Junction and Storage Temperature Range	T _J , T _{stg}	-65 to 200		°C



ELECTRICAL CHARACTERISTICS (T _A = 25°C unless otherwise noted)					
Characteristic	Symbol	Min	Max	Unit	
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage ⁽¹⁾ (I _C = 10 mAdc, I _E = 0)	V _{(BR)CEO}	40 60	— —	V _{dc}	
Collector-Base Breakdown Voltage (I _E = 10 μAdc)	V _{(BR)CBO}	60	—	V _{dc}	
Emitter-Base Breakdown Voltage (I _E = 10 μAdc)	V _{(BR)EBO}	5.0	—	V _{dc}	
Collector Cutoff Current (V _{CB} = 50 Vdc)	I _{CBO}	— —	0.02 0.01	μAdc	
@ T _A = 150°C (V _{CB} = 50 Vdc)		— —	20 10		

⁽¹⁾ Pulsed. Pulse Width 25% to 35% μs. Duty Cycle 1:2 to 2:3.

continued

2N2904JAN, 2N2905JAN SERIES

ELECTRICAL CHARACTERISTICS — continued (T _A = 25°C unless otherwise noted.)					
Characteristic	Symbol	Min	Max	Unit	
OFF CHARACTERISTICS — (continued)					
Collector-Emitter Cutoff Current (V _{CE} = 40 Vdc) (V _{CE} = 60 Vdc)	2N2904, 2N2905 2N2904A, 2N2905A	I _{CES}	— —	1.0 1.0	μAdc
Emitter Cutoff Current (V _{EB} = 3.5 Vdc, I _C = 0)		I _{EBO}	—	0.05	μAdc
ON CHARACTERISTICS					
DC Current Gain ⁽¹⁾ (I _C = 0.1 mAdc, V _{CE} = 10 Vdc)	2N2904 2N2905 2N2904A 2N2905A	h _{FE}	20 35 40 75	— — — —	—
(I _C = 1.0 mAdc, V _{CE} = 10 Vdc)	2N2904 2N2905 2N2904A 2N2905A		25 50 40 100	175 450 175 450	
(I _C = 10 mAdc, V _{CE} = 10 Vdc)	2N2904 2N2905 2N2904A 2N2905A		35 75 40 100	— — — —	
(I _C = 150 mAdc, V _{CE} = 10 Vdc)	2N2904, 2N2904A 2N2905, 2N2905A		40 100	120 300	
(I _C = 500 mAdc, V _{CE} = 10 Vdc)	2N2904 2N2905 2N2904A 2N2905A		20 30 40 50	— — — —	
(I _C = 1.0 mAdc, V _{CE} = 10 Vdc, T _A = -55°C)	2N2904 2N2905 2N2904A 2N2905A		15 30 20 50	— — — —	
Collector-Emitter Saturation Voltage ⁽¹⁾ (I _C = 150 mAdc, I _B = 15 mAdc) (I _C = 500 mAdc, I _B = 50 mAdc)		V _{CE(sat)}	— —	0.4 1.6	Vdc
Base-Emitter Saturation Voltage ⁽¹⁾ (I _C = 150 mAdc, I _B = 15 mAdc) (I _C = 500 mAdc, I _B = 50 mAdc)		V _{BE(sat)}	— —	1.3 2.6	Vdc
SMALL-SIGNAL CHARACTERISTICS					
Output Capacitance (V _{CB} = 10 Vdc, f = 0.1 to 1.0 MHz)		C _{obo}	—	8.0	pF
Input Capacitance (V _{EB} = 2.0 Vdc, f = 0.1 to 1.0 MHz)		C _{ibo}	—	30	pF
Current Gain (I _C = 1.0 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz)	2N2904 2N2905 2N2904A 2N2905A	h _{fe}	25 50 40 100	— — — —	—
Small-Signal Current Transfer Ratio, Magnitude (I _C = 50 mAdc, V _{CE} = 20 Vdc, f = 100 MHz)		h _{fe}	2.0	—	—
SWITCHING CHARACTERISTICS (See Figure 31)					
Turn-On Time		t _(on)	—	45	ns
Turn-Off Time		t _(off)	—	300	ns

⁽¹⁾ Pulsed. Pulse Width 250 to 350 μs. Duty Cycle 1.0 to 2.0%.

ASSURANCE TESTING (Pre/Post Burn-In)					
Burn-In Conditions: T _A = 25 ± 3°C, V _{CB} = 30 Vdc, 10 Vdc for JANS					
P _T = 600 mW					
Characteristics Tested	Symbol	Initial and End Point Limits		Unit	
		Min	Max		
Collector Cutoff Current (V _{CB} = 50 Vdc)	2N2904, 2N2905 2N2904A, 2N2905A	I _{CBO}	— —	20 10	nAdc
DC Current Gain ⁽¹⁾ (I _C = 150 mAdc, V _{CE} = 10 Vdc)	2N2904, 2N2904A 2N2905, 2N2905A	h _{FE}	40 100	120 300	—

Delta from Pre-Burn-In Measured Values		Min	Max	% of Initial Value
Delta Collector Cutoff Current	ΔI _{CBO}	—	±100 or ±5.0 whichever is greater	
Delta DC Current Gain ⁽¹⁾	Δh _{FE}	—	±15	% of Initial Value

⁽¹⁾ Pulsed. Pulse Width 250 to 350 μs. Duty Cycle 1.0 to 2.0%.