SEMICONDUCTOR
TECHNICAL DATA

2N2904,
2N2904A,
2N2905
2N2905A

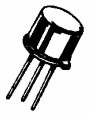
CRYSTALONICS
2805 Veterans Highway
Suite 14
Ronkonkoma, N.Y. 11779

PNP Silicon
Small-Signal Transistors

. . .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	Vdc
Collector-Base Voltage	V_{CBO}	60		Vdc
Emitter-Base Voltage	V_{EBO}	5.0		Vdc
Collector Current — Continuous	I_C	600		mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C @ T_C = 25°C Derate above 25°C	P_T	0.6 3.43 3.0 17.2		Watts mW/°C Watts mW/°C
Operating Junction and Storage Temperature Range	T_J, T_{stg}	−65 to 200		°C



CASE 79-04, STYLE 1
TO-205AD (TO-39)

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)	2N2904, 2N2905 2N2904A, 2N2905A	$V_{(BR)CEO}$	40 60	— —	Vdc
Collector-Base Breakdown Voltage (I_E = 10 μAdc)		$V_{(BR)CBO}$	60	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 μAdc)		$V_{(BR)EBO}$	5.0	—	Vdc
Collector Cutoff Current (V_{CB} = 50 Vdc)	2N2904, 2N2905 2N2904A, 2N2905A	I_{CBO}	— —	0.02 0.01	μAdc
@ T_A = 150°C (V_{CB} = 50 Vdc)	2N2904, 2N2905 2N2904A, 2N2905A		— —	20 10	

[1] Pulsed: Pulse Width 250 to 350 μs, Duty Cycle 1.0 to 2.0%.

(continued)

ELECTRICAL CHARACTERISTICS — continued (T_A = 25°C unless otherwise noted.)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS — (continued)					
Collector-Emitter Cutoff Current		I_{CES}			μAdc
(V_{CE} = 40 Vdc)	2N2904, 2N2905		—	1.0	
(V_{CE} = 60 Vdc)	2N2904A, 2N2905A		—	1.0	
Emitter Cutoff Current (V_{EB} = 3.5 Vdc, I_C = 0)		I_{EBO}	—	0.05	μAdc
ON CHARACTERISTICS					
DC Current Gain[1]		h_{FE}			—
(I_C = 0.1 mAdc, V_{CE} = 10 Vdc)	2N2904		20	—	
	2N2905		35	—	
	2N2904A		40	—	
	2N2905A		75	—	
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc)	2N2904		25	175	
	2N2905		50	450	
	2N2904A		40	175	
	2N2905A		100	450	
(I_C = 10 mAdc, V_{CE} = 10 Vdc)	2N2904		35	—	
	2N2905		75	—	
	2N2904A		40	—	
	2N2905A		100	—	
(I_C = 150 mAdc, V_{CE} = 10 Vdc)	2N2904, 2N2904A		40	120	
	2N2905, 2N2905A		100	300	
(I_C = 500 mAdc, V_{CE} = 10 Vdc)	2N2904		20	—	
	2N2905		30	—	
	2N2904A		40	—	
	2N2905A		50	—	
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, T_A = −55°C)	2N2904		15	—	
	2N2905		30	—	
	2N2904A		20	—	
	2N2905A		50	—	
Collector-Emitter Saturation Voltage[1]		$V_{CE(sat)}$			Vdc
(I_C = 150 mAdc, I_B = 15 mAdc)			—	0.4	
(I_C = 500 mAdc, I_B = 50 mAdc)			—	1.6	
Base-Emitter Saturation Voltage[1]		$V_{BE(sat)}$			Vdc
(I_C = 150 mAdc, I_B = 15 mAdc)			—	1.3	
(I_C = 500 mAdc, I_B = 50 mAdc)			—	2.6	
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		h_{fe}			—
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	2N2904		25	—	
	2N2905		50	—	
	2N2904A		40	—	
	2N2905A		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		I_{CBO}			nAdc
(V_{CB} = 50 Vdc)	2N2904, 2N2905		—	20	
	2N2904A, 2N2905A		—	10	
DC Current Gain[1]		h_{FE}			—
(I_C = 150 mAdc, V_{CE} = 10 Vdc)	2N2904, 2N2904A		40	120	
	2N2905, 2N2905A		100	300	

Delta from Pre-Burn-In Measured Values		Min	Max	
Delta Collector Cutoff Current	ΔI_{CBO}	—	±100 or ±5.0 whichever is greater	% of Initial Value nAdc
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%.