SEMICONDUCTOR
TECHNICAL DATA

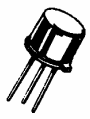
2N4405

PNP Silicon
Small-Signal Transistor

. . .designed for general-purpose switching and amplifier applications.

3

MAXIMUM RATINGS			
Rating	**Symbol**	**Value**	**Unit**
Collector-Emitter Voltage	V_{CEO}	80	Vdc
Collector-Base Voltage	V_{CBO}	80	Vdc
Emitter-Base Voltage	V_{EBO}	5.0	Vdc
Collector Current — Continuous	I_C	0.5	Adc
Device Dissipation @ T_A @ 25°C Derate above 25°C @ T_C @ 25°C Derate above 25°C	P_T	 1.0 5.72 5.0 28.6	 Watts mW/°C Watts mW/°C
Operating Junction and Storage Temperature Range	T_{op}, 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_B = 0)	$V_{(BR)CEO}$	80	—	Vdc
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	$V_{(BR)CBO}$	80	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 μAdc)	$V_{(BR)EBO}$	5.0	—	Vdc
Collector Cutoff Current (V_{CB} = 60 Vdc, I_E = 0) (V_{CB} = 60 Vdc, I_E = 0, T_A = 150°C)	I_{CBO}	 — —	 25 25	 nAdc μAdc
Emitter-Cutoff Current (V_{BE} = 3.0 Vdc, I_C = 0)	I_{EBO}	—	25	nAdc

(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
ON CHARACTERISTICS				
DC Current Gain(1) (I_C = 0.1 mAdc, V_{CE} = 5.0 Vdc) (I_C = 10 mAdc, V_{CE} = 5.0 Vdc) (I_C = 150 mAdc, V_{CE} = 5.0 Vdc) (I_C = 500 mAdc, V_{CE} = 5.0 Vdc) (I_C = 150 mAdc, V_{CE} = 5.0 Vdc, T_A = −65 ±3°C)	h_{FE}	 75 100 100 50 40	 — — 300 — —	—
Collector-Emitter Saturation Voltage(1) (I_C = 10 mAdc, I_B = 1.0 mAdc) (I_C = 150 mAdc, I_B = 15 mAdc) (I_C = 500 mAdc, I_B = 50 mAdc)	$V_{CE(sat)}$	 — — —	 0.15 0.2 0.5	Vdc
Base-Emitter Saturation Voltage(1) (I_C = 10 mAdc, I_B = 1.0 mAdc) (I_C = 500 mAdc, I_B = 50 mAdc)	$V_{CE(sat)}$	 — 0.85	 0.8 1.2	Vdc
Base-Emitter On-Voltage (I_C = 150 mAdc, V_{CE} = 5.0 Vdc)	V_{BE}	—	0.9	Vdc
SMALL-SIGNAL CHARACTERISTICS				
Collector-Base Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 0.1 to 1.0 MHz)	Cobo	—	10	pF
Small-Signal Current Transfer Ratio, Magnitude (I_C = 50 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)	$\|h_{fe}\|$	2.0	6.0	—
Noise Figure (I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz, R_S = 100 ohms)	NF	—	3.5	dB
SWITCHING CHARACTERISTICS (See Figure 33) (I_C = 500 mAdc, $V_{BE(off)}$ = 0.8 Vdc, I_B = 50 mAdc)				
Delay Time	t_d	—	15	ns
Rise Time	t_r	—	25	ns
Storage Time	t_s	—	175	ns
Fall Time	t_f	—	50	ns

ASSURANCE TESTING (Pre/Post Burn-In)
Burn-In Conditions: T_A = 25 ±3°C, V_{CB} = 40 Vdc
P_T = 1.0 W

Characteristics Tested	Symbol	Initial and End Point Limits		Unit
		Min	Max	
Collector Cutoff Current (V_{CB} = 60 Vdc)	I_{CBO}	—	25	nAdc
DC Current Gain(1) (I_C = 10 mAdc, V_{CE} = 5.0 Vdc)	h_{FE}	100	—	—

Delta from Pre-Burn-In Measured Values		Min	Max	
Delta Collector Cutoff Current	ΔI_{CBO}	—	±100 or ±10 whichever is greater	% of Initial Value nAdc
Delta DC Current Gain(1)	Δh_{FE}	—	±20	%

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