SEMICONDUCTOR
TECHNICAL DATA

2N2222,
2N2222A,

NPN Silicon
Small-Signal Transistors

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

MAXIMUM RATINGS

Rating	Symbol	2N2221 2N2222	2N2221A 2N2222A	Unit
Collector-Emitter Voltage	V_{CEO}	30	50	Vdc
Collector-Base Voltage	V_{CBO}	60	75	Vdc
Emitter-Base Voltage	V_{EBO}	5.0	6.0	Vdc
Collector Current — Continuous	I_C	800		mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C @ T_C = 25°C Derate above 25°C	P_T	0.5 2.85 1.8 10.3		W mW/°C W mW/°C
Operating Junction and Storage Temperature Range	T_J, T_{stg}	−65 to 200		°C

CASE 22-03, STYLE 1
TO-206AA (TO-18)

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)	2N2221, 2N2222 2N2221A, 2N2222A	$V_{(BR)CEO}$	 30 50	 — —	Vdc
Collector-Base Breakdown Voltage (I_E = 10 μAdc)	2N2221, 2N2222 2N2221A, 2N2222A	$V_{(BR)CBO}$	 60 75	 — —	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 μAdc)	2N2221, 2N2222 2N2221A, 2N2222A	$V_{(BR)EBO}$	 5.0 6.0	 — —	Vdc
Collector Cutoff Current (V_{CE} = 30 Vdc) (V_{CE} = 50 Vdc)	2N2221, 2N2222 2N2221A, 2N2222A	I_{CES}	 — —	 10 10	μAdc

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

(continued)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS (continued)					
Collector Cutoff Current		I_{CBO}			μAdc
(V_{CB} = 50 Vdc)	2N2221, 2N2222		—	0.01	
(V_{CB} = 60 Vdc)	2N2221A, 2N2222A		—	0.01	
@ T_A = 150 C					
(V_{CB} = 50 Vdc)	2N2221, 2N2222		—	10	
(V_{CB} = 60 Vdc)	2N2221A, 2N2222A		—	10	
Emitter Cutoff Current (V_{EB} = 4.0 Vdc, I_C = 0)		I_{EBO}	—	0.01	μAdc
ON CHARACTERISTICS					
DC Current Gain		h_{FE}			—
(I_C = 0.1 mAdc, V_{CE} = 10 Vdc)	2N2221		20	—	
	2N2222		35	—	
	2N2221A		30	—	
	2N2222A		50	—	
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc)	2N2221		25	150	
	2N2222		50	325	
	2N2221A		35	150	
	2N2222A		75	325	
(I_C = 10 mAdc, V_{CE} = 10 Vdc)	2N2221		35	—	
	2N2222		75	—	
	2N2221A		40	—	
	2N2222A		100	—	
(I_C = 150 mAdc, V_{CE} = 10 Vdc)	2N2221A		40	120	
	2N2222A		100	300	
(I_C = 500 mAdc, V_{CE} = 10 Vdc)[1]	2N2221, 2N2221A		20	—	
	2N2222, 2N2222A		30	—	
(I_C = 10 mAdc, V_{CE} = 10 Vdc, T_A = −55 C)	2N2221, 2N2221A		15	—	
	2N2222, 2N2222A		35	—	
Collector-Emitter Saturation Voltage[1]		$V_{CE(sat)}$			Vdc
(I_C = 150 mAdc, I_B = 15 mAdc)	2N2221, 2N2222		—	0.4	
	2N2221A, 2N2222A		—	0.3	
(I_C = 500 mAdc, I_B = 50 mAdc)	2N2221, 2N2222		—	1.6	
	2N2221A, 2N2222A		—	1.0	
Base-Emitter Saturation Voltage[1]		$V_{BE(sat)}$			Vdc
(I_C = 150 mAdc, I_B = 15 mAdc)	2N2221, 2N2222		0.6	1.3	
	2N2221A, 2N2222A		0.6	1.2	
(I_C = 500 mAdc, I_B = 50 mAdc)	2N2221, 2N2222		—	2.6	
	2N2221A, 2N2222A		—	2.0	
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} = 0.5 Vdc, f = 0.1 to 1.0 MHz)		C_{ibo}	—	25	pF
Current Gain		h_{fe}			—
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	2N2221		25	—	
	2N2222		50	—	
	2N2221A		30	—	
	2N2222A		50	—	
Small-Signal Current Transfer Ratio, Magnitude (I_C = 20 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)		$\|h_{fe}\|$	2.5	—	—

(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
SWITCHING CHARACTERISTICS (See Figure 10)					
Turn-On Time	2N2221, 2N2222	$t_{(on)}$	—	40	ns
	2N2221A, 2N2222A		—	35	
Turn-Off Time	2N2221, 2N2222	$t_{(off)}$	—	250	ns
	2N2221A, 2N2222A		—	300	

ASSURANCE TESTING (Pre/Post Burn-In)
Burn-In Conditions: T_A = 25 ±3°C, V_{CB} = 24 Vdc 2N2221, 2N2222, 30 Vdc 2N2221A, 2N2222A, 10 Vdc JANS
P_T = 400 mW

Characteristics Tested		Symbol	Initial and End Point Limits		Unit
			Min	Max	
Collector Cutoff Current		I_{CBO}			nAdc
(V_{CB} = 50 Vdc)	2N2221, 2N2222		—	10	
(V_{CB} = 60 Vdc)	2N2221A, 2N2222A		—	10	
DC Current Gain[1]		h_{FE}			—
(I_C = 150 mAdc, V_{CE} = 10 Vdc)	2N2221, 2N2222		40	120	
	2N2221A, 2N2222A		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%.