



NEW ENGLAND SEMICONDUCTOR

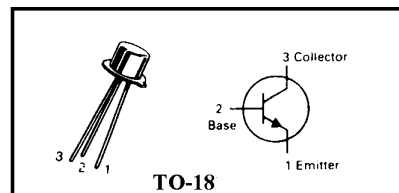
2N2221
2N2221A*
2N2222
2N2222A*

*also available as
 JAN, JANTX,
 JANTXV

MAXIMUM RATINGS

Rating	Symbol	2N2221 2N2222	2N2221A 2N2222A	Unit
Collector-Emitter Voltage	V_{CEO}	30	40	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 @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	0.5	2.28	Watts
		mW/ $^\circ\text{C}$		
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	1.2	6.85	Watts
		mW/ $^\circ\text{C}$		
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200		$^\circ\text{C}$

GENERAL PURPOSE TRANSISTORS NPN SILICON



ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristics	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage $I_C = 10 \text{ mAdc}, I_B = 0$	$V_{(BR)CEO}$	30 40		Vdc
Collector-Base Breakdown Voltage $I_C = 10 \mu\text{Adc}, I_E = 0$	$V_{(BR)CBO}$	60 75		Vdc
Emitter-Base Breakdown Voltage $I_E = 10 \mu\text{Adc}, I_C = 0$	$V_{(BR)EBO}$	5.0 6.0		Vdc
Collector Cutoff Current $V_{CE} = 60 \text{ Vdc}, V_{EB(off)} = 3.0 \text{ Vdc}$	I_{CEX}		10	nAdc
Collector Cutoff Current $V_{CB} = 50 \text{ Vdc}, I_E = 0$ $V_{CB} = 60 \text{ Vdc}, I_E = 0$ $V_{CB} = 50 \text{ Vdc}, I_E = 0, T_A = 150^\circ\text{C}$ $V_{CB} = 60 \text{ Vdc}, I_E = 0, T_A = 150^\circ\text{C}$	I_{CBO}		0.01 0.01 10 10	μAdc
Emitter Cutoff Current $V_{EB} = 3.0 \text{ Vdc}, I_C = 0$	I_{EBO}		10	nAdc
Base Cutoff Current $V_{CE} = 60 \text{ Vdc}, V_{EB(off)} = 3.0 \text{ Vdc}$	I_{BL}		20	nAdc

ON CHARACTERISTICS

DC Current Gain				
$I_C = 0.1 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$	2N2221, 2N2221A 2N2222, 2N2222A	h_{FE}	20 35	-
$I_C = 1.0 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$	2N2221, 2N2221A 2N2222, 2N2222A		25 50	
$I_C = 10 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}$	2N2221, 2N2221A 2N2222, 2N2222A		35 75	
$I_C = 10 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}, T_A = -55^\circ\text{C}$	2N2221A 2N2222A		15 35	
$I_C = 150 \text{ mAdc}, V_{CE} = 10 \text{ Vdc (1)}$	2N2221, 2N2221A 2N2222, 2N2222A		40 100	120 300
$I_C = 150 \text{ mAdc}, V_{CE} = 1.0 \text{ Vdc (1)}$	2N2221, 2N2221A 2N2222, 2N2222A		20 50	
$I_C = 500 \text{ mAdc}, V_{CE} = 10 \text{ Vdc (1)}$	2N2221 2N2222 2N2221A 2N2222A		20 30 25 40	

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6 Lake Street Lawrence, MA 01841
 1-800-446-1158 / (978) 794-1666 / FAX: (978) 689-0803

T4-4.8-860-346 REV: --



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2N2221A*
2N2222
2N2222A*

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JAN, JANTX,
JANTXV

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$ unless otherwise noted) continued

Characteristics	Symbol	Min	Max	Unit
ON CHARACTERISTICS (CONTINUED)				
Collector-Emitter Saturation Voltage (1) $I_C = 150\text{ mAdc}, I_B = 15\text{ mAdc}$ 2N2221, 2N2222 2N2221A, 2N2222A $I_C = 500\text{ mAdc}, I_B = 50\text{ mAdc}$ 2N2221, 2N2222 2N2221A, 2N2222A	$V_{CE(sat)}$		0.4 0.3 1.6 1.0	Vdc
Base-Emitter Saturation Voltage (1) $I_C = 150\text{ mAdc}, I_B = 15\text{ mAdc}$ 2N2221, 2N2222 2N2221A, 2N2222A $I_C = 500\text{ mAdc}, I_B = 50\text{ mAdc}$ 2N2221, 2N2222 2N2221A, 2N2222A	$V_{BE(sat)}$	0.6 0.6	1.3 1.2 2.6 2.0	Vdc

SMALL-SIGNAL CHARACTERISTICS

Current-Gain -- Bandwidth Product (2) $I_C = 20\text{ mAdc}, V_{CE} = 20\text{ Vdc}, f = 100\text{ MHz}$ 2N2221A 2N2222A	f_T	250 300		MHz
Output Capacitance $V_{CB} = 10\text{ Vdc}, I_E = 0, f = 100\text{ kHz}$	C_{obo}		8.0	pF
Input Capacitance $V_{EB} = 0.5\text{ Vdc}, I_C = 0, f = 100\text{ kHz}$ 2N2221, 2N2222 2N2221A, 2N2222A	C_{ibo}		30 25	pF
Input Impedance $I_C = 1.0\text{ mAdc}, V_{CE} = 10\text{ Vdc}, f = 1.0\text{ kHz}$ 2N2221A 2N2222A $I_C = 10\text{ mAdc}, V_{CE} = 10\text{ Vdc}, f = 1.0\text{ kHz}$ 2N2221A 2N2222A	h_{ie}	1.0 2.0 0.2 0.25	3.5 8.0 1.0 1.25	kohms
Small-Signal Current Gain $I_C = 1.0\text{ mAdc}, V_{CE} = 10\text{ Vdc}, f = 1.0\text{ kHz}$ 2N2221A 2N2222A $I_C = 10\text{ mAdc}, V_{CE} = 10\text{ Vdc}, f = 1.0\text{ kHz}$ 2N2221A	h_{fe}	30 50 50 75	150 300 300 375	
Noise Figure $I_C = 100\text{ }\mu\text{Adc}, V_{CE} = 10\text{ Vdc},$ $R_S = 1.0\text{ kohm}, f = 1.0\text{ kHz}$ 2N2222A	NF		4.0	dB

SWITCHING CHARACTERISTICS

Delay time	$V_{CC} = 30\text{ Vdc}, V_{BE(off)} = 0.5\text{ Vdc},$	t_d	10	ns
Rise Time	$I_C = 150\text{ mAdc}, I_{B1} = 15\text{ mAdc}$	t_r	25	ns
Storage Time	$V_{CC} = 30\text{ Vdc}, I_C = 150\text{ mAdc},$	t_s	225	ns
Fall Time	$I_{B1} = I_{B2} = 15\text{ mAdc}$	t_f	60	ns

(1) Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2.0\%$.

(2) f_T is defined as the frequency at which $|h_{fe}|$ extrapolates to unity.

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