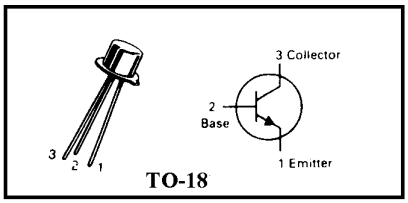
NEW ENGLAND SEMICONDUCTOR

2N2221
2N2221A*
2N2222
2N2222A*

*also available as JAN, JANTX, JANTXV

GENERAL PURPOSE TRANSISTORS NPN SILICON



TO-18

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 @ $T_A = 25^0C$ Derate above 25^0C	P_D	0.5 2.28		Watts $mW/^0C$
Total Device Dissipation @ $T_C = 25^0C$ Derate above 25^0C	P_D	1.2 6.85		Watts $mW/^0C$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200		^0C

ELECTRICAL CHARACTERISTICS ($T_A = 25^0C$ unless otherwise noted)

Characteristics		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage		$V_{(BR)CEO}$			Vdc
$I_C = 10$ mAdc, $I_B = 0$	2N2221, 2N2222		30		
	2N2221A, 2N2222A		40		
Collector-Base Breakdown Voltage		$V_{(BR)CBO}$			Vdc
$I_C = 10$ µAdc, $I_E = 0$	2N2221, 2N2222		60		
	2N2221A, 2N2222A		75		
Emitter-Base Breakdown Voltage		$V_{(BR)EBO}$			Vdc
$I_E = 10$ µAdc, $I_C = 0$	2N2221, 2N2222		5.0		
	2N2221A, 2N2222A		6.0		
Collector Cutoff Current		I_{CEX}			
$V_{CE} = 60$ Vdc, $V_{EB(off)} = 3.0$ Vdc	2N2221A, 2N2222A			10	nAdc
Collector Cutoff Current		I_{CBO}			
$V_{CB} = 50$ Vdc, $I_E = 0$	2N2221, 2N2222			0.01	µ Adc
$V_{CB} = 60$ Vdc, $I_E = 0$	2N2221A, 2N2222A			0.01	
$V_{CB} = 50$ Vdc, $I_E = 0$, $T_A = 150^0C$	2N2221, 2N2222			10	
$V_{CB} = 60$ Vdc, $I_E = 0$, $T_A = 150^0C$	2N2221A, 2N2222A			10	
Emitter Cutoff Current		I_{EBO}			
$V_{EB} = 3.0$ Vdc, $I_C = 0$	2N2221A, 2N2222A			10	nAdc
Base Cutoff Current		I_{BL}			
$V_{CE} = 60$ Vdc, $V_{EB(off)} = 3.0$ Vdc	2N2221A, 2N2222A			20	nAdc
ON CHARACTERISTICS					
DC Current Gain					-
$I_C = 0.1$ mAdc, $V_{CE} = 10$ Vdc	2N2221, 2N2221A	h_{FE}	20		
	2N2222, 2N2222A		35		
$I_C = 1.0$ mAdc, $V_{CE} = 10$ Vdc	2N2221, 2N2221A		25		
	2N2222, 2N2222A		50		
$I_C = 10$ mAdc, $V_{CE} = 10$ Vdc	2N2221, 2N2221A		35		
	2N2222, 2N2222A		75		
$I_C = 10$ mAdc, $V_{CE} = 10$ Vdc, $T_A = -55^0C$	2N2221A		15		
	2N2222A		35		
$I_C = 150$ mAdc, $V_{CE} = 10$ Vdc (1)	2N2221, 2N2221A		40	120	
	2N2222, 2N2222A		100	300	
$I_C = 150$ mAdc, $V_{CE} = 1.0$ Vdc (1)	2N2221, 2N2221A		20		
	2N2222, 2N2222A		50		
$I_C = 500$ mAdc, $V_{CE} = 10$ Vdc (1)	2N2221		20		
	2N2222		30		
	2N2221A		25		
	2N2222A		40		

Datasheet Directory

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

NEW ENGLAND SEMICONDUCTOR

2N2221
2N2221A*
2N2222
2N2222A*

*also available as JAN, JANTX, JANTXV

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted) continued

Characteristics		Symbol	Min	Max	Unit
ON CHARACTERISTICS (CONTINUED)					
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					
Current-Gain -- Bandwidth Product (2)					
I_C = 20 mAdc, V_{CE} = 20 Vdc, f = 100 MHz	2N2221A	f_T	250		MHz
	2N2222A		300		
Output Capacitance		C_{obo}			
V_{CB} = 10 Vdc, I_E = 0, f = 100 kHz				8.0	pF
Input Capacitance		C_{ibo}			
V_{EB} = 0.5 Vdc, I_C = 0, f = 100 kHz	2N2221, 2N2222			30	pF
	2N2221A, 2N2222A			25	
Input Impedance					
I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz	2N2221A	h_{ie}	1.0	3.5	kohms
	2N2222A		2.0	8.0	
I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz	2N2221A		0.2	1.0	
	2N2222A		0.25	1.25	
Small-Signal Current Gain					
I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz	2N2221A	h_{fe}	30	150	
	2N2222A		50	300	
I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz	2N2221A		50	300	
			75	375	
Noise Figure		NF			
I_C = 100 µAdc, V_{CE} = 10 Vdc,				4.0	dB
R_S = 1.0 kohm, f = 1.0 kHz	2N2222A				
SWITCHING CHARACTERISTICS					
Delay time	V_{CC} = 30 Vdc, $V_{BE(off)}$ = 0.5 Vdc,	t_d		10	ns
Rise Time	I_C = 150 mAdc, I_{B1} = 15 mAdc	t_r		25	ns
Storage Time	V_{CC} = 30 Vdc, I_C = 150 mAdc,	t_s		225	ns
Fall Time	I_{B1} = I_{B2} = 15 mAdc	t_f		60	ns

(1)Pulse Test: Pulse Width ≤ 300µs, Duty Cycle ≤2.0%.

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

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