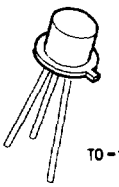
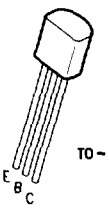
National Semiconductor

2N2222 2N2222A PN2222 PN2222A MMBT2222 MMBT2222A MPQ2222*



TL/G/10100-9



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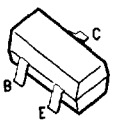

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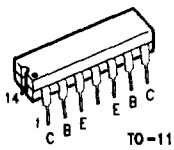

TL/G/10100-7

NPN General Purpose Amplifier

Electrical Characteristics T_A = 25°C unless otherwise noted

Symbol	Parameter		Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage (Note 1)				
	(I_C = 10 mA, I_B = 0)	2222	30		V
		2222A	40		
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage				
	(I_C = 10 μA, I_E = 0)	2222	60		V
		2222A	75		
$V_{(BR)EBO}$	Emitter Base Breakdown Voltage				
	(I_E = 10 μA, I_C = 0)	2222	5.0		V
		2222A	6.0		
I_{CEX}	Collector Cutoff Current				
	(V_{CE} = 60V, $V_{EB(OFF)}$ = 3.0V)	2222A		10	nA
I_{CBO}	Collector Cutoff Current				
	(V_{CB} = 50V, I_E = 0)	2222		0.01	
	(V_{CB} = 60V, I_E = 0)	2222A		0.01	
	(V_{CB} = 50V, I_E = 0, T_A = 150°C)	222		10	μA
	(V_{CB} = 60V, I_E = 0, T_A = 150°C)	2222A		10	
I_{EBO}	Emitter Cutoff Current				
	(V_{EB} = 3.0V, I_C = 0)	2222A		10	nA
I_{BL}	Base Cutoff Current				
	(V_{CE} = 60V, $V_{EB(OFF)}$ = 3.0)	2222A		20	nA
ON CHARACTERISTICS					
h_{FE}	DC Current Gain				
	(I_C = 0.1 mA, V_{CE} = 10V)		35		
	(I_C = 1.0 mA, V_{CE} = 10V)		50		
	(I_C = 10 mA, V_{CE} = 10V)		75		
	(I_C = 10 mA, V_{CE} = 10V, T_A = −55°C)		35		
	(I_C = 150 mA, V_{CE} = 10V) (Note 1)		100	300	
	(I_C = 150 mA, V_{CE} = 1.0V) (Note 1)		50		
	(I_C = 500 mA, V_{CE} = 10V) (Note 1)	2222	30		
		2222A	40		

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

*16-SOIC version also available. Contact factory.

NPN General Purpose Amplifier (Continued)

Electrical Characteristics T_A = 25°C unless otherwise noted (Continued)

Symbol	Parameter		Min	Max	Units
ON CHARACTERISTICS (Continued)					
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage (Note 1)				
	(I_C = 150 mA, I_B = 15 mA)	2222		0.4	V
		2222A		0.3	
	(I_C = 500 mA, I_B = 50 mA)	2222		1.6	
		2222A		1.0	
$V_{BE(sat)}$	Base-Emitter Saturation Voltage (Note 1)				
	(I_C = 150 mA, I_B = 15 mA)	2222	0.6	1.3	V
		2222A	0.6	1.2	
	(I_C = 500 mA, I_B = 50 mA)	2222		2.6	
		2222A		2.0	
SMALL-SIGNAL CHARACTERISTICS					
f_T	Current Gain—Bandwidth Product (Note 3)				
	(I_C = 20 mA, V_{CE} = 20V, f = 100 MHz)	2222	250		MHz
		2222A	300		
C_{obo}	Output Capacitance (Note 3)				
	(V_{CB} = 10V, I_E = 0, f = 100 kHz)			8.0	pF
C_{ibo}	Input Capacitance (Note 3)				
	(V_{EB} = 0.5V, I_C = 0, f = 100 kHz)	2222		30	pF
		2222A		25	
$rb'C_C$	Collector Base Time Constant				
	(I_E = 20 mA, V_{CB} = 20V, f = 31.8 MHz)	2222A		150	ps
NF	Noise Figure				
	(I_C = 100 μA, V_{CE} = 10V, R_S = 1.0 kΩ, f = 1.0 kHz)	2222A		4.0	dB
$Re(h_{ie})$	Real Part of Common-Emitter				
	High Frequency Input Impedance				
	(I_C = 20 mA, V_{CE} = 20V, f = 300 MHz)			60	Ω
SWITCHING CHARACTERISTICS					
t_D	Delay Time	(V_{CC} = 30V, $V_{BE(OFF)}$ = 0.5V,	except		10	ns
t_R	Rise Time	I_C = 150 mA, I_{B1} = 15 mA)	MPQ2222		25	ns
t_S	Storage Time	(V_{CC} = 30V, I_C = 150 mA,	except		225	ns
t_F	Fall Time	I_{B1} = I_{B2} = 15 mA	MPQ2222		60	ns

Note 1: Pulse Test: Pulse Width < 300 μs, Duty Cycle ≤ 2.0%.

Note 2: For characteristics curves, see Process 19.

Note 3: f_T is defined as the frequency at which $|h_{fe}|$ extrapotates to unity.

Note 4: 2N also available in JAN/TX/V series.