ELECTRONICS, INC.
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2N2222A
Silicon NPN Transistor
Small Signal General Purpose Amplifier & Switch
TO–18 Type Package

Absolute Maximum Ratings:

Collector–Emitter Voltage, V_{CEO} 40V
Collector–Base Voltage, V_{CBO} 75V
Emitter–Base Voltage, V_{EBO} 6V
Continuous Collector Current, I_C 800mA
Total Device Dissipation (T_A = +25°C), P_D 400mW
Derate Above +25°C . . . . . 2.28mW/°C
Total Device Dissipation (T_C = +25°C), P_D 1.2W
Derate Above +25°C . . . . . 6.85mW/°C
Operating Temperature Range, T_J . . . . . –65° to +200°C
Storage Temperature Range, T_{stg} . . . . . –65° to +200°C
Thermal Resistance, Junction–to–Ambient, R_{thJA} . . . . . 437.5°C/W
Thermal Resistance, Junction–to–Case, R_{thJC} . . . . . 145.8°C/W

Electrical Characteristics: (T_A = 25°C unless otherwise specified)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
OFF Characteristics							
Collector–Emitter Breakdown Voltage	$V_{(BR)CEO}$	I_C = 10mA, I_B = 0		40	–	–	V
Collector–Base Breakdown Voltage	$V_{(BR)CBO}$	I_C = 10μA, I_E = 0		75	–	–	V
Emitter–Base Breakdown Voltage	$V_{(BR)EBO}$	I_E = 10μA, I_C = 0		6	–	–	V
Collector Cutoff Current	I_{CEX}	V_{CE} = 60V, $V_{EB(off)}$ = 3V		–	–	10	nA
Collector Cutoff Current	I_{CBO}	V_{CB} = 60V, I_E = 0		–	–	0.01	μA
		V_{CB} = 60V, I_E = 0, T_A = +150°C		–	–	10	μA
Emitter Cutoff Current	I_{EBO}	V_{EB} = 3V, I_C= 0		–	–	10	nA
Base Cutoff Current	I_{BL}	V_{CE} = 60V, $V_{EB(off)}$ = 3V		–	–	20	nA
ON Characteristics							
DC Current Gain	h_{FE}	V_{CE} = 10V	I_C = 0.1mA	35	–	–	
			I_C = 1mA	50	–	–	
			I_C = 10mA, Note 1	75	–	–	
			I_C = 10mA, T_A = +150°C, Note 1	35	–	–	
			I_C = 150mA, Note 1	100	–	300	
		V_{CE} = 1V, I_C = 150mA, Note 1		50	–	–	
		V_{CE} = 10V, I_C = 500mA, Note 1		40	–	–	

Note 1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.

Electrical Characteristics (Cont'd): (T_A = 25°C unless otherwise specified)

Parameter	Symbol	Test Conditions		Min	Typ	Max	Unit
ON Characteristics (Cont'd)							
Collector–Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 150mA, I_B = 15mA, Note 1		–	–	0.3	V
		I_C = 500mA, I_B = 50mA, Note 1		–	–	1.0	V
Base–Emitter Saturation Voltage	$V_{BE(sat)}$	I_C = 150mA, I_B = 15mA, Note 1		0.6	–	1.2	V
		I_C = 500mA, I_B = 50mA, Note 1		–	–	2.0	V
Small–Signal Characteristics							
Current Gain – Bandwidth Product	f_T	I_C = 20mA, V_{CE} = 20V, f = 100Mhz, Note 2		300	–	–	MHz
Output Capacitance	C_{obo}	V_{CB} = 10V, I_E = 0, f = 1Mhz, Note 3		–	–	8	pF
Input Capacitance	C_{ibo}	V_{EB} = 500mV, I_C = 0, f = 1Mhz, Note 3		–	–	25	pF
Input Impedance	h_{je}	I_C = 1mA	V_{CE} = 10V, f = 1kHz	2.0	–	8.0	kΩ
		I_C = 10mA		0.25	–	1.25	kΩ
Voltage Feedback Ratio	h_{re}	I_C = 1mA	V_{CE} = 10V, f = 1kHz	–	–	8.0	x 10^4
		I_C = 10mA		–	–	4.0	x 10^4
Small–Signal Current Gain	h_{fe}	I_C = 1mA	V_{CE} = 10V, f = 1kHz	50	–	300	
		I_C = 10mA		75	–	375	
Output Admittance	h_{oe}	I_C = 1mA	V_{CE} = 10V, f = 1kHz	5	–	35	μmhos
		I_C = 10mA		15	–	200	μmhos
Collector–Base Time Constant	$rb'C_c$	V_{CB} = 20V, I_E = 20mA, f = 31.8MHz		–	–	150	ps
Noise Figure	NF	V_{CE}= 10V, I_C = 100μA, R_S = 1kΩ, f = 1kHz		–	–	4.0	dB
Real Part of Common–Emitter High Frequency Input Impedance	$Re(h_{je})$	V_{CE} = 20V, I_C = 20mA, f = 300MHz		–	–	60	Ω
Switching Characteristics							
Delay Time	t_d	V_{CC} = 30V, $V_{BE(off)}$ = –500mV, I_C = 150mA, I_{B1} = 15mA		–	–	10	ns
Rise Time	t_r			–	–	25	ns
Storage Time	t_s	V_{CC} = 30V, I_C = 150mA, I_{B1} = I_{B2} = 15mA		–	–	225	ns
Fall Time	t_f			–	–	60	ns
Active Region Time Constant	T_A	V_{CE} = 30V, I_C = 150mA		–	–	2.5	ns

Note 1. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.

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

Note 3. 2N5581 and 2N5582 are Listed C_{cb} and C_{ab} for these conditions and values.