P2N2222
P2N2222A

CASE 29-02, STYLE 17
TO-39 (TO-226AA)

AMPLIFIER TRANSISTORS

NPN SILICON

Refer to MPS2222 for graphs.

MAXIMUM RATINGS

Rating	Symbol	P2N 2222	P2N 2222A	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	600		mAdc
Total Device Dissipation T_A = 25°C Derate above 25°C	P_D	625 5.0		mW mW/°C
Total Device Dissipation T_C = 25°C Derate above 25°C	P_D	1.5 12		Watts mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−55 to +150		°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	83.3	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	200	°C/W

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage (I_C = 10 mAdc, I_B = 0)	P2N2222 P2N2222A	$V_{(BR)CEO}$	 30 40	 — —	Vdc
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	P2N2222 P2N2222A	$V_{(BR)CBO}$	 60 75	 — —	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	P2N2222 P2N2222A	$V_{(BR)EBO}$	 5.0 6.0	 — —	Vdc
Collector Cutoff Current (V_{CE} = 60 Vdc, $V_{EB(off)}$ = 3.0 Vdc)	P2N2222A	I_{CEX}	—	10	nAdc
Collector Cutoff Current (V_{CB} = 50 Vdc, I_E = 0) (V_{CB} = 60 Vdc, I_E = 0) (V_{CB} = 50 Vdc, I_E = 0, T_A = 150°C) (V_{CB} = 60 Vdc, I_E = 0, T_A = 150°C)	 P2N2222 P2N2222A P2N2222 P2N2222A	I_{CBO}	 — — — —	 0.01 0.01 10 10	μAdc
Emitter Cutoff Current (V_{EB} = 3.0 Vdc, I_C = 0)	P2N2222A	I_{EBO}	—	10	nAdc
Base Cutoff Current (V_{CE} = 60 Vdc, $V_{EB(off)}$ = 3.0 Vdc)	P2N2222A	I_{BEX}	—	20	nAdc
ON CHARACTERISTICS					
DC Current Gain (I_C = 0.1 mAdc, V_{CE} = 10 Vdc) (I_C = 1.0 mAdc, V_{CE} = 10 Vdc) (I_C = 10 mAdc, V_{CE} = 10 Vdc) (I_C = 10 mAdc, V_{CE} = 10 Vdc, T_A = −55°C) (I_C = 150 mAdc, V_{CE} = 10 Vdc) (1) (I_C = 150 mAdc, V_{CE} = 1.0 Vdc) (1) (I_C = 500 mAdc, V_{CE} = 10 Vdc) (1)	 P2N2222A only P2N2222 P2N2222A	h_{FE}	 35 50 75 35 100 50 30 40	 — — — — 300 — — —	—
Collector-Emitter Saturation Voltage (1) (I_C = 150 mAdc, I_B = 15 mAdc) (I_C = 500 mAdc, I_B = 50 mAdc)	 P2N2222 P2N2222A P2N2222 P2N2222A	$V_{CE(sat)}$	 — — — —	 0.4 0.3 1.6 1.0	Vdc

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

Characteristic		Symbol	Min	Max	Unit
Base-Emitter Saturation Voltage (1)		$V_{BE(sat)}$			Vdc
(I_C = 150 mAdc, I_B = 15 mAdc)	P2N2222		—	1.3	
	P2N2222A		0.6	1.2	
(I_C = 500 mAdc, I_B = 50 mAdc)	P2N2222		—	2.6	
	P2N2222A		—	2.0	
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain – Bandwidth Product (2)		f_T			MHz
(I_C = 20 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)	P2N2222		250	—	
	P2N2222A		300	—	
Output Capacitance		C_{obo}			pF
(V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz)			—	8.0	
Input Capacitance		C_{ibo}			pF
(V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz)	P2N2222		—	30	
	P2N2222A		—	25	
Input Impedance		h_{ie}			kΩ
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	P2N2222A		2.0	8.0	
(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	P2N2222A		0.25	1.25	
Voltage Feedback Ratio		h_{re}			$X10^{-4}$
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	P2N2222A		—	8.0	
(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	P2N2222A		—	4.0	
Small-Signal Current Gain		h_{fe}			—
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	P2N2222A		50	300	
(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	P2N2222A		75	375	
Output Admittance		h_{oe}			μmhos
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	P2N2222A		5.0	35	
(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz)	P2N2222A		25	200	
Collector Base Time Constant		$r_b'C_c$			ps
(I_E = 20 mAdc, V_{CB} = 20 Vdc, f = 31.8 MHz)	P2N2222A		—	150	
Noise Figure (I_C = 100 μAdc,		N_F			dB
V_{CE} = 10 Vdc, R_S = 1.0 kΩ, f = 1.0 kHz)	P2N2222A			4.0	
SWITCHING CHARACTERISTICS MPS2222A only					
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) (Figure 1)	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) (Figure 2)	t_f	—	60	ns

(1) Pulse Test: Pulse Width ≦ 300 μs, Duty Cycle ≦ 2.0%. (2) f_T is defined as the frequency at which $|h_{fe}|$ extrapolates to unity.

SWITCHING TIME EQUIVALENT TEST CIRCUITS

FIGURE 1 – TURN-ON TIME

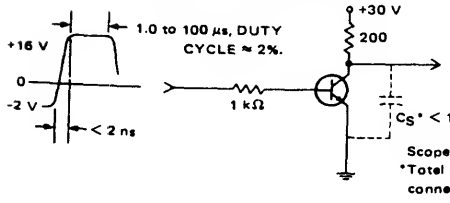

FIGURE 2 – TURN-OFF TIME