

T-29-23

Signal Transistors

**GES2906, 6A, 7, 7A, MPS2906, 6A, 7, 7A,
GES2221A, 22A, MPS2222A, PN2222A**

Silicon Transistors



TO-92

Features:

- Low leakage currents
- High speed switching
- Epoxy encapsulation with proved reliability—excellent characteristic stability under environmental stresses, 85°C @ 85% RH
- Low collector saturation voltages

The GE/RCA GES2221A, 22A, MPS2222A, PN2222A NPN types, and GES2906, 06A, 07, 07A, MPS2906, 06A, 07, and 07A PNP types are planar epitaxial passivated silicon transistors intended for general purpose amplifiers, saturated

switching, and core applications. The GES, MPS and PN prefixes can be used interchangeably, characteristics for each line are similar. PNP values are negative; observe proper polarity. These types are supplied in JEDEC TO-92 package.

MAXIMUM RATINGS, Absolute-Maximum Values:

	2221A 2222A	2906,06A 2907,07A	
COLLECTOR TO EMITTER VOLTAGE (V_{CE0})	40	-40	V
EMITTER TO BASE VOLTAGE (V_{EB0})	5	-5	V
COLLECTOR TO BASE VOLTAGE (V_{CB0})	75	-60	V
CONTINUOUS COLLECTOR CURRENT (I_C)	400	-350	mA
COLLECTOR CURRENT (peak) (I_C)	800	-700	mA
TOTAL POWER DISSIPATION $T_A \leq 25^\circ\text{C}$ (P_T)	360	360	mW
TOTAL POWER DISSIPATION $T_C \leq 25^\circ\text{C}$ (P_T)	1000	1000	mW
DERATE FACTOR, $T_A > 25^\circ\text{C}$	3.6	3.6	mW/°C
DERATE FACTOR, $T_C > 25^\circ\text{C}$	10	7	mW/°C
OPERATING TEMPERATURE (T_J)	-65 to +150		°C
STORAGE TEMPERATURE (T_{STG})	-65 to +125		°C
LEAD TEMPERATURE $1/16" \pm 1/32"$ (1.58mm \pm 0.8mm) from case at 10s max. (T_L)	+260		°C

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ELECTRICAL CHARACTERISTICS, At Ambient Temperature (T_A) = 25°C Unless Otherwise Specified

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CHARACTERISTICS	SYMBOL	LIMITS						UNITS			
		2221A,22A		2906,06A		2907,07A					
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.				
Collector-Emitter Breakdown Voltage ($I_C = 10mA, I_B = 0$)*	$V_{(BR)ECO}$	40	—	-40	—	-40	—	V			
Collector-Base Breakdown Voltage ($I_C = 10\mu A, I_E = 0$)	$V_{(BR)CBO}$	75	—	-60	—	-60	—				
Emitter-Base Breakdown Voltage ($I_E = 10\mu A, I_C = 0$)	$V_{(BR)EBQ}$	5	—	-5	—	-5	—				
Collector-Cutoff Current ($V_{CB} = 60V, I_E = 0$)* ($V_{CB} = 60V, I_E = 0, T_A = 100^\circ C$)*	I_{CBO}	—	10	—	-20	—	-50	nA			
		—	10	—	-20	—	-20	μA			
Collector-Emitter Saturation Voltage ($I_C = 150mA, I_B = 15mA$)* ($I_C = 500mA, I_B = 50mA$)	$V_{CE(SAT)}$	—	0.3	—	-0.4	—	-0.4	V			
		—	1	—	-1.6	—	-1.6				
Base-Emitter Saturation Voltage ($I_C = 150mA, I_B = 15mA$)* ($I_C = 500mA, I_B = 50mA$)*	$V_{CE(SAT)}$	—	1.1	—	-1.3	—	-1.3	V			
		—	2	—	-2.6	—	-2.6				
DC Forward Current Transfer Ratio ($V_{CE} = 1.0V, I_C = 150mA$)* ($V_{CE} = 10V, I_C = 0.1mA$) ($V_{CE} = 10V, I_C = 1.0mA$) ($V_{CE} = 10V, I_C = 10mA$) ($V_{CE} = 10V, I_C = 150mA$)* ($V_{CE} = 10V, I_C = 500mA$)*	h_{FE}	2221A		2222A		2906,06A		2907,07A		UNITS	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.		
		20	—	50	—	—	—	—	—		—
		20	—	35	—	20	—	35	—		
		25*	—	*50	—	25	—	50	—		
		35	—	75	—	35	—	75	—		
		40	120	100	300	40	120	100	300		
20	—	30	—	20	—	30	—				
Collector Capacitance ($V_{CB} = 10V, I_E = 0, f = 1MHz$)	C_{cb}	—	8	—	8	—	8	—	pF		
Emitter-Base Capacitance ($V_{EB} = 0.5V, I_C = 0, f = 1MHz$)	C_{eb}	—	25	—	25	—	30	—	30		
Delay Time ($I_{CS} = 150mA, I_{B1} = 15mA$)	t_d	—	—	—	—	—	10	—	10	ns	
Rise Time ($I_{CS} = 150mA, I_{B1} = 15mA$)	t_r	—	—	—	—	—	40	—	40		
Storage Time ($I_{CS} = 150mA, I_{B1} = I_{B2} = 15mA$)	t_s	—	—	—	—	—	80	—	80		
Fall Time ($I_{CS} = 150mA, I_{B1} = 15mA$)	t_f	—	—	—	—	—	30	—	30		
Turn-On Time ($I_C = 150mA, V_{CC} = 30V, I_{B1} = 15mA$)		—	35	—	35	—	—	—	—		
Turn-Off Time ($I_C = 150mA, V_{CC} = 30V, I_{B1} = I_{B2} = 15mA$)	t_{ON}	—	285	—	285	—	—	—	—		

*Pulse conditions: 300 μs pulse width, 2% duty cycle.

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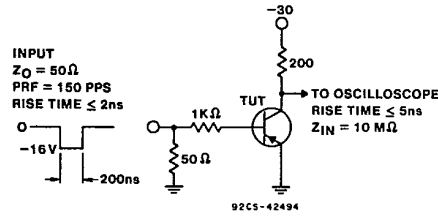


Fig. 1—Delay time and rise time test circuit for pnp types (2906, 06A, 07, 07A).

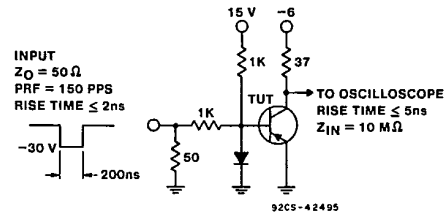


Fig. 2—Storage time and fall time test circuit for pnp types (2906, 06A, 07, 07A).

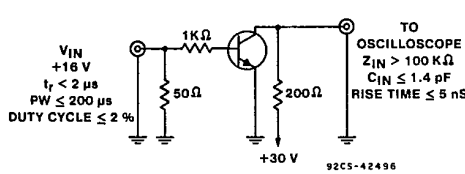


Fig. 3—Turn-on time test circuit for npn types (2221A and 2222A).

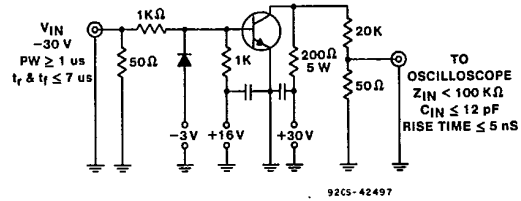


Fig. 4—Turn-off time test circuit for npn types (2221A and 2222A).

TERMINAL CONNECTIONS

- Lead 1 - Emitter
- Lead 2 - Base
- Lead 3 - Collector