Saturated logic switch and VHF amplifier

The 2N914 is an NPN double-diffused silicon Planar epitaxial transistor encased in the JEDEC TO-18 package. It provides improved operation over the popular 2N706 and 2N708, and also gives greater latitude in circuit design. The Planar structure provides low leakage currents, wide beta range, and superior reliability. The epitaxial feature gives an extremely low V_{CEsat} that is relatively temperature insensitive. The 2N914 is primarily a universal switch but it is also an excellent high-speed high-gain logic and memory driver at collector currents up to 500 mA.

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

Symbol	Characteristic and test conditions	Min.	Typ.	Max.	Unit
h_{FE}	DC Pulse Current Gain (5)				
	I_C=10mA V_{CE}=1V	30	55	120	
	I_C=500mA V_{CE}=5V	10	17		
	I_C=10mA V_{CE}=1V T_A=-55°C	12	28		
V_{BEsat}	Base Saturation Voltage (5)				
	I_C=10mA I_B=1mA	0.70	0.74	0.80	V
V_{CEsat}	Collector Saturation Voltage (5)				
	I_C=200mA I_B=20mA		0.40	0.70	V
	I_C=10 I_B T_A=-55 to 125°C (5and6)		0.20	0.25	V
h_{fe}	High Frequency Current Gain				
	I_C=20mA V_{CE}=10V f=100mc	3	3.7		
C_{ob}	Output Capacitance				
	I_E=0 V_{CB}=10V		4.5	6	pF
C_{ib}	Input Capacitance				
	I_C=0 V_{EB}=0.5V			9	pF
I_{CBO}	Collector Cutoff Current				
	I_E=0 V_{CB}=20V		4	25	m µA
	I_E=0 V_{CB}=20V T_A=150°C		3	15	µA
BV_{CBO}	Collector to Base Breakdown Voltage				
	I_C=1 µA I_E=0	40			V
$V_{CER(sust)}$	Collector to Emitter Sustaining Voltage (4 and 5)				
	I_C=30mA (pulsed) R_{BE}≤10 Ω	20			V
$V_{CEO(sust)}$	Collector to Emitter Sustaining Voltage (4 and 5)				
	I_C=30mA (pulsed) I_B=0	15			V
BV_{EBO}	Emitter to Base Breakdown Voltage				
	I_C=0 I_E=10 µA	5			V
I_{EBO}	Emitter Current				
	I_C=0 V_{EB}=4V		0.007	0.1	µA
I_{CEX}	Collector Current				
	V_{CE}=20V V_{BE}=-0.25V T_A=125°C		3	10	µA
τ_s	Charge Storage Time Constant (7 and 8)				
	I_C=I_{B1} ≈ 20mA, I_{B2} ≈ -20mA		13	20	nsec
t_{d+r}	Turn on Time (8)				
	I_C ≈ 200mA, I_{B1} ≈ 40mA		25	40	nsec
t_{s+f}	Turn off Time (8)				
	I_C ≈ 200mA, I_{B1} ≈ 40mA, I_{B2} ≈ -20mA		25	40	nsec

NOTES :
1) These ratings are limiting values above which the serviceability of any individual semiconductor device may be impaired.
2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.
3) These ratings give a maximum junction temperature of 200°C and junction-to-case thermal resistance of 145°C/W (derating factor of 6.9 mW/°C) junction to-ambient thermal resistance of 486°C/W (derating factor of 2.1 mW/°C).
4) Rating refers to a high current point where collector-to-emitter voltage is lowest. For more information send for SGS AR5.
5) Pulse conditions: length = 300 µsec; duty cycle ≈ 1%.
6) I_C= 1mA through 20 mA.
7) Measured on Sampling Scope. PW ≥ 200 nsec.
8) See switching circuits for exact values of I_C, I_{B1}, and I_{B2}.

ABSOLUTE MAXIMUM RATINGS (1)
(T_A = 25° C unless otherwise noted)

Voltages

Collector to Base	V_{CBO}	40 V
Collector to Emitter (4) (R_{BE} ≤ 10 Ω)	V_{CER}	20 V
Collector to Emitter (4)	V_{CEO}	15 V
Emitter to Base	V_{EBO}	5 V

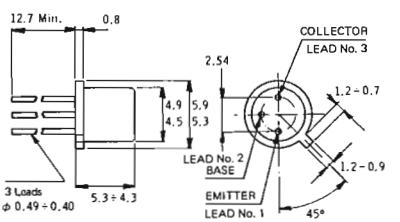
Temperatures

Storage Temperature	T_{STG}	-65°C to +300°C
Operating Junction Temperature	T_J	200°C max
Lead Temperature (Soldering, No Time Limit)	T_L	300°C max

Power (2 and 3)

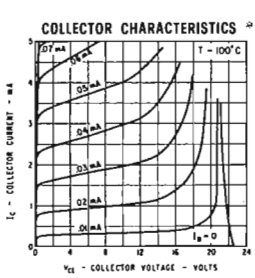
Dissipation at 25°C Case Temperature	P_D	1.2 W
Dissipation at 100°C Case Temperature	P_D	0.68 W
Dissipation at 25°C Ambient Temperature	P_D	0.36 W

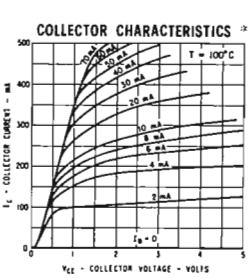
PHYSICAL DIMENSIONS
in accordance with
JEDEC TO-18 outline

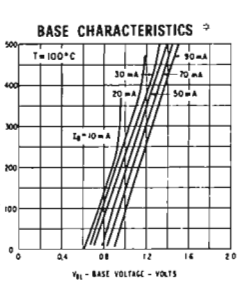


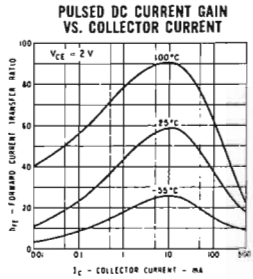
Notes : all dimensions in mm.

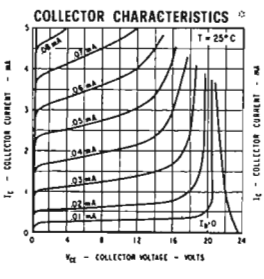
TYPICAL ELECTRICAL CHARACTERISTICS

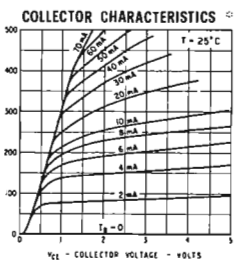


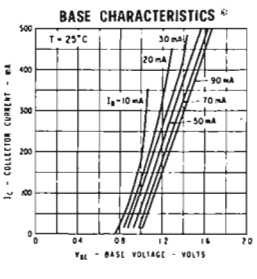


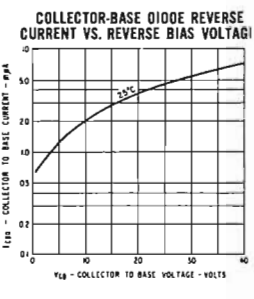


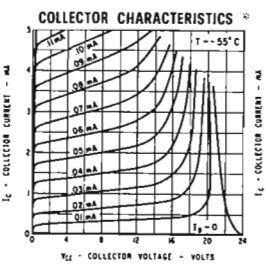


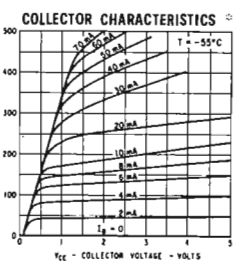


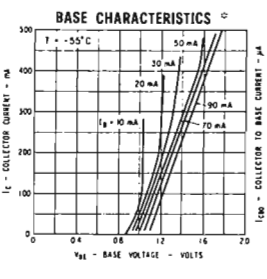


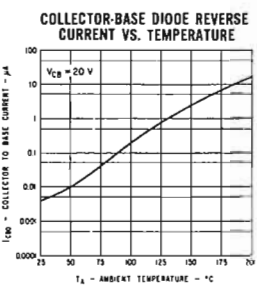


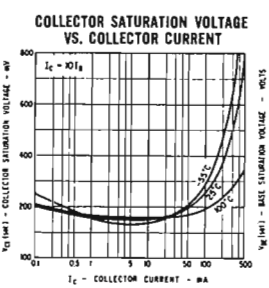


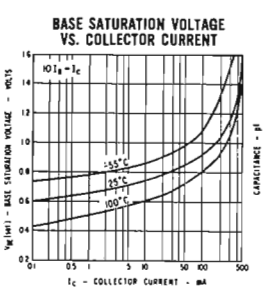


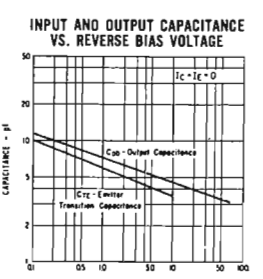


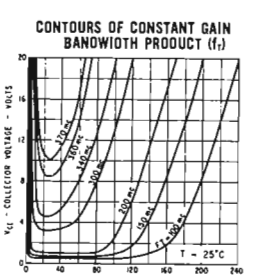








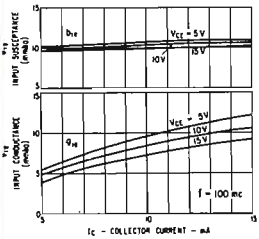




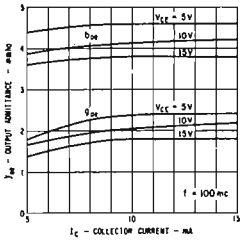
*Single family characteristics on Transistor Curve Tracer.

TYPICAL ELECTRICAL CHARACTERISTICS

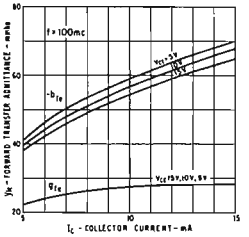
INPUT ADMITTANCE VERSUS COLLECTOR CURRENT — OUTPUT SHORT CIRCUIT



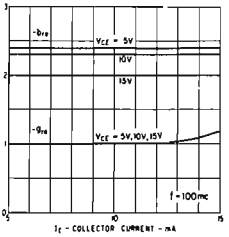
OUTPUT ADMITTANCE VERSUS COLLECTOR CURRENT — INPUT SHORT CIRCUIT



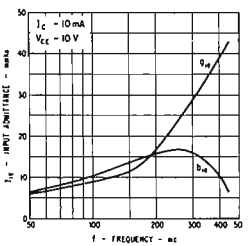
FORWARD TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT — OUTPUT SHORT CIRCUIT



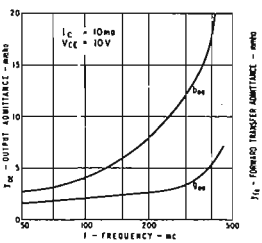
REVERSE TRANSFER ADMITTANCE VERSUS COLLECTOR CURRENT — INPUT SHORT CIRCUIT



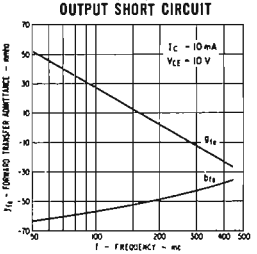
INPUT ADMITTANCE VERSUS FREQUENCY — OUTPUT SHORT CIRCUIT



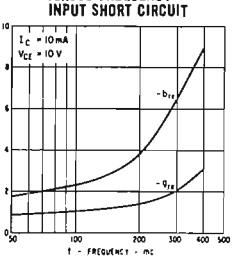
OUTPUT ADMITTANCE VERSUS FREQUENCY — INPUT SHORT CIRCUIT



FORWARD TRANSFER ADMITTANCE VERSUS FREQUENCY — OUTPUT SHORT CIRCUIT

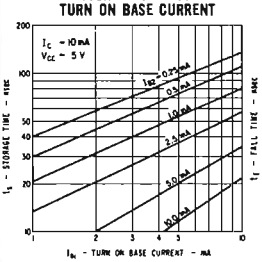


REVERSE TRANSFER ADMITTANCE VERSUS FREQUENCY — INPUT SHORT CIRCUIT

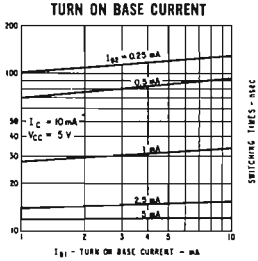


TYPICAL PERFORMANCE DATA

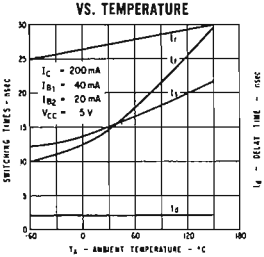
STORAGE TIME VS. TURN ON BASE CURRENT



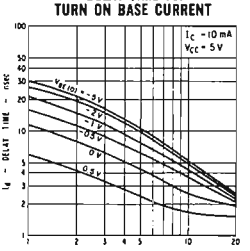
FALL TIME VS. TURN ON BASE CURRENT



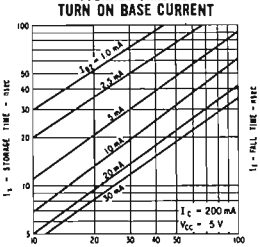
SWITCHING TIMES VS. TEMPERATURE



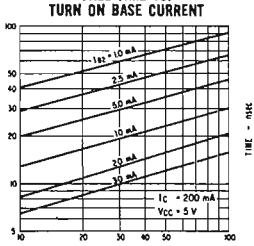
DELAY TIME VS. TURN ON BASE CURRENT



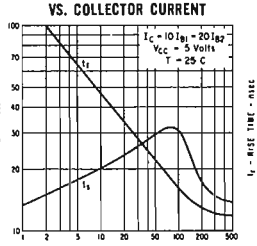
STORAGE TIME VS. TURN ON BASE CURRENT



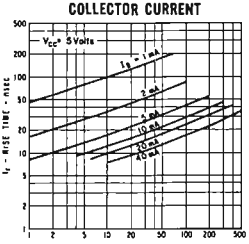
FALL TIME VS. TURN ON BASE CURRENT



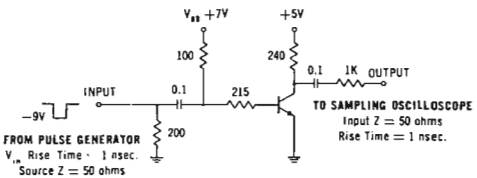
STORAGE AND FALL TIMES VS. VS. COLLECTOR CURRENT



RISE TIME VS. COLLECTOR CURRENT



CHARGE STORAGE TIME-CONSTANT TEST CIRCUIT



T_{on} AND T_{off} TEST CIRCUIT