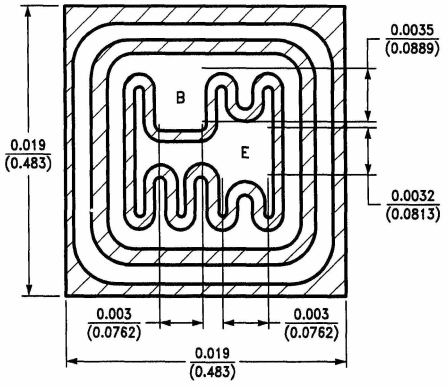
National Semiconductor

Process 63
PNP Medium Power



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DESCRIPTION

Process 63 is a non-overlay, double-diffused, silicon epitaxial device. Complement to Process 19.

APPLICATION

This device was designed for use as general purpose amplifiers and switches requiring collector currents to 500 mA.

PRINCIPAL DEVICE TYPES

TO-5 EBC: 2N2905
TO-18 EBC: 2N2907A
TO-237 EBC: TN2905
TO-92 EBC: PN2907A, 2N4403
TO-116: MPQ2907
TO-236: MMBT2907
16-SOIC: MMPQ2907

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

Symbol	Conditions	Min	Typ	Max	Units
t_{ON}	I_C = 150 mA, I_{B1} = 15 mA *(Figure 1)*		30	45	ns
t_{OFF}	I_C = 150 mA, I_{B2} = 15 mA *(Figure 2)*		220	290	ns
C_{CB}	V_{CB} = 10V		6	8	pF
C_{EB}	V_{EB} = 0.50V			20	pF
h_{fe}	I_C = 20 mA, V_{CE} = 20V, f = 100 MHz	1.5	2.5		
NF(spot)	I_C = 100 μA, V_{CE} = 10V, R_S = 1k, f = 1 kHz		1.5		dB
h_{FE}	I_C = 1 mA, V_{CE} = 10V I_C = 10 mA, V_{CE} = 10V I_C = 150 mA, V_{CE} = 10V I_C = 500 mA, V_{CE} = 10V	50 50 50 30	 150	 400	
$V_{CE(SAT)}$	I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA			0.5 1.2	V V
$V_{BE(SAT)}$	I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA			1.3 1.6	V V
BV_{CEO}	I_C = 10 mA	35			V
BV_{CBO}	I_C = 100 μA	50			V
BV_{EBO}	I_E = 10 μA	6			V
I_{CBO}	V_{CB} = 35V			100	nA
I_{EBO}	V_{EB} = 4V			100	nA

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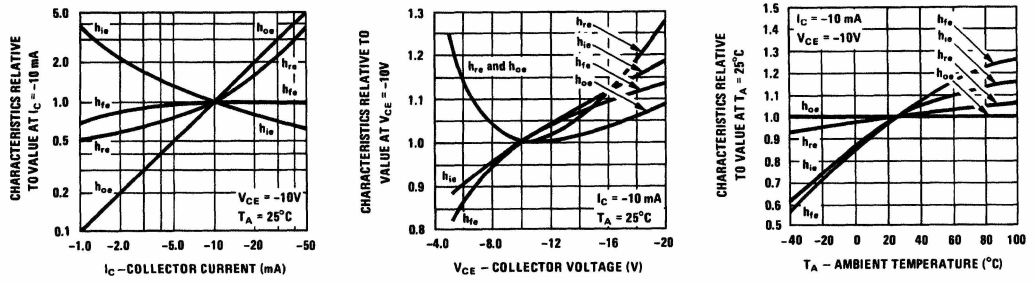
ELECTRICAL CHARACTERISTICS (T_A = 25°C) (Continued)

Symbol	Conditions	Min	Typ	Max	Units
$P_{D(max)}$					
TO-5	T_C = 25°C	3			W
	T_A = 25°C	800			mW
TO-18	T_C = 25°C	1.7			W
	T_A = 25°C	600			mW
TO-237	T_C = 25°C	2			W
	T_A = 25°C	850			mW
TO-116	T_A = 25°C				
	(Each Transistor)	500			mW
	(Total Dissipation)	900			mW
TO-236	T_C = 25°C	350			mW
$T_{J(max)}$	All Metal Can Parts	200			°C
	All Plastic Parts	150			°C

SMALL SIGNAL CHARACTERISTICS (f = 1.0 kHz)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
h_{ie}	Input Resistance	I_C = 10 mA, V_{CE} = −10V		480	2000	Ω
h_{oe}	Output Conductance	I_C = 10 mA, V_{CE} = −10V		80	1200	μmhos
h_{re}	Voltage Feedback Ratio	I_C = 10 mA, V_{CE} = −10V		162	1500	$\times 10^{-6}$
h_{fe}	Small Signal Current Gain	I_C = 10 mA, V_{CE} = −10V	100			

TYPICAL COMMON EMITTER CHARACTERISTICS (f = 1.0 kHz)



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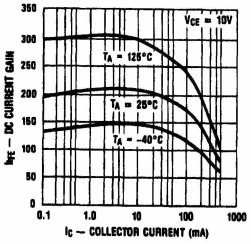
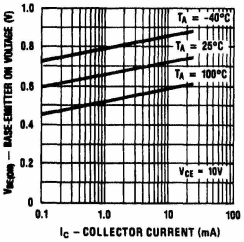
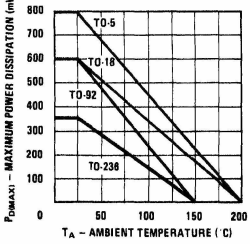
DC Pulsed Current Gain vs Collector Current



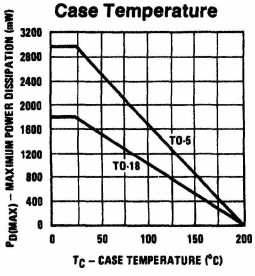
Base-Emitter ON Voltage vs Collector Current



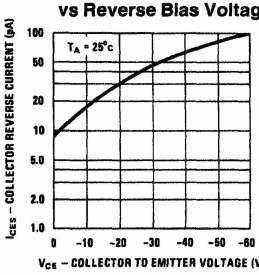
Maximum Power Dissipation vs Ambient Temperature



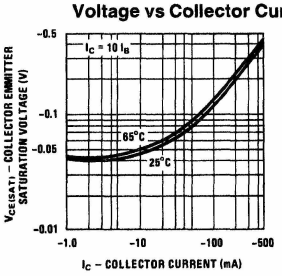
Maximum Power Dissipation vs Case Temperature



Collector Reverse Current vs Reverse Bias Voltage



Pulsed Collector Saturation Voltage vs Collector Current



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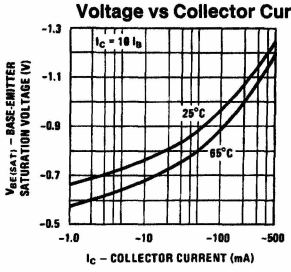
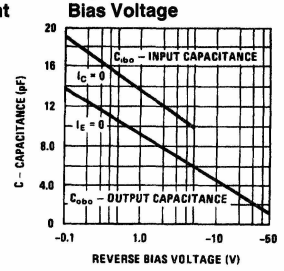
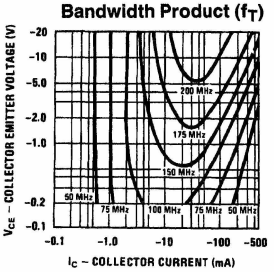
Pulsed Base Saturation Voltage vs Collector Current



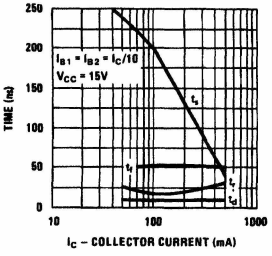
Input and Output Capacitances vs Reverse Bias Voltage



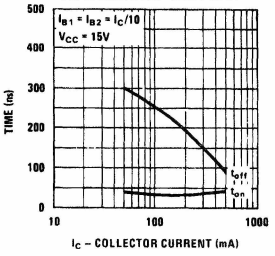
Contours of Constant Gain Bandwidth Product (f_T)



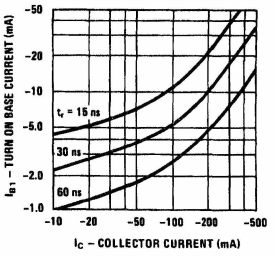
Switching Times vs Collector Current



Turn On and Turn Off Times vs Collector Current



Rise Time vs Collector and Turn On Base Currents



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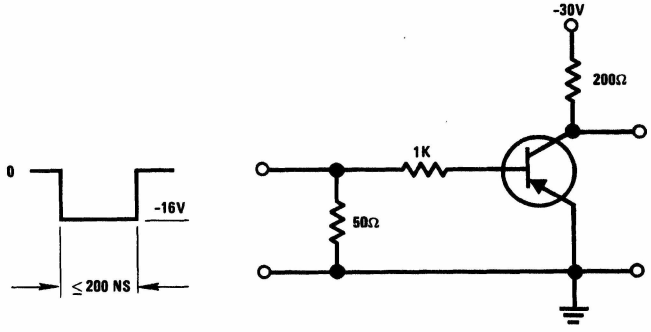

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FIGURE 1. Saturated Turn On Switching Time Test Circuit

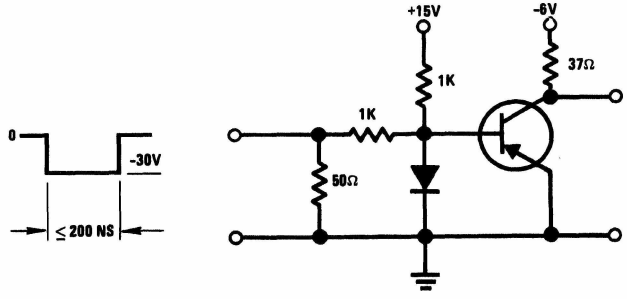

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FIGURE 2. Saturated Turn Off Switching Time Test Circuit