

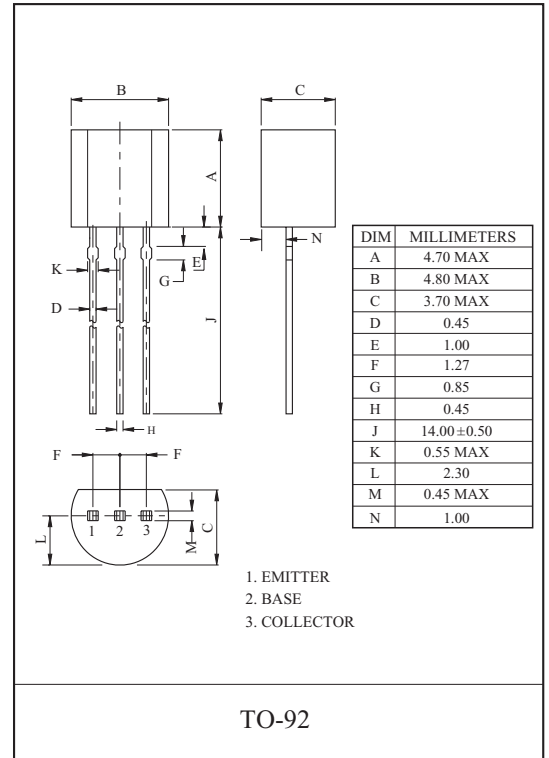
GENERAL PURPOSE APPLICATION.  
SWITCHING APPLICATION.

### FEATURES

- Low Leakage Current  
:  $I_{CEX}=50nA(\text{Max.}), I_{BL}=50nA(\text{Max.})$   
@  $V_{CE}=30V, V_{EB}=3V$ .
- Low Saturation Voltage  
:  $V_{CE(\text{sat})}=0.3V(\text{Max.})$  @  $I_C=50mA, I_B=5mA$ .
- Low Collector Output Capacitance  
:  $C_{ob}=4pF(\text{Max.})$  @  $V_{CB}=5V$ .
- Complementary to 2N3906A.

### MAXIMUM RATING (Ta=25 °C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Collector-Base Voltage		$V_{CBO}$	60	V
Collector-Emitter Voltage		$V_{CEO}$	40	V
Emitter-Base Voltage		$V_{EBO}$	6	V
Collector Current		$I_C$	200	mA
Base Current		$I_B$	50	mA
Collector Power Dissipation	Ta=25 °C	$P_C$	625	mW
	Tc=25 °C		1.5	W
Junction Temperature		$T_j$	150	°C
Storage Temperature Range		$T_{stg}$	-55 ~ 150	°C



# 2N3904A

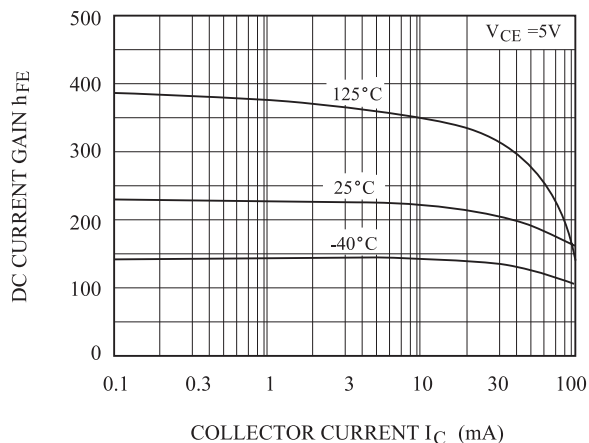
## ELECTRICAL CHARACTERISTICS (Ta=25 °C)

CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Collector Cut-off Current		$I_{CEX}$	$V_{CE}=30V, V_{EB}=3V$	-	-	50	nA
Base Cut-off Current		$I_{BL}$	$V_{CE}=30V, V_{EB}=3V$	-	-	50	nA
Collector-Base Breakdown Voltage		$V_{(BR)CBO}$	$I_C=10\mu A, I_E=0$	60	-	-	V
Collector-Emitter Breakdown Voltage		$V_{(BR)CEO}$	$I_C=1mA, I_B=0$	40	-	-	V
Emitter-Base Breakdown Voltage		$V_{(BR)EBO}$	$I_E=10\mu A, I_C=0$	6.0	-	-	V
DC Current Gain	*	$h_{FE}(1)$	$V_{CE}=1V, I_C=0.1mA$	40	-	-	
		$h_{FE}(2)$	$V_{CE}=1V, I_C=1mA$	70	-	-	
		$h_{FE}(3)$	$V_{CE}=1V, I_C=10mA$	100	-	300	
		$h_{FE}(4)$	$V_{CE}=1V, I_C=50mA$	60	-	-	
		$h_{FE}(5)$	$V_{CE}=1V, I_C=100mA$	30	-	60	
Collector-Emitter Saturation Voltage	*	$V_{CE(sat)1}$	$I_C=10mA, I_B=1mA$	-	-	0.2	V
		$V_{CE(sat)2}$	$I_C=50mA, I_B=5mA$	-	-	0.3	
Base-Emitter Saturation Voltage	*	$V_{BE(sat)1}$	$I_C=10mA, I_B=1mA$	0.65	-	0.85	V
		$V_{BE(sat)2}$	$I_C=50mA, I_B=5mA$	-	-	0.95	
Transition Frequency		$f_T$	$V_{CE}=20V, I_C=10mA, f=100MHz$	300	-	-	MHz
Collector Output Capacitance		$C_{ob}$	$V_{CB}=5V, I_E=0, f=1MHz$	-	-	4.0	pF
Input Capacitance		$C_{ib}$	$V_{BE}=0.5V, I_C=0, f=1MHz$	-	-	8.0	pF
Input Impedance		$h_{ie}$	$V_{CE}=10V, I_C=1mA, f=1kHz$	1.0	-	10	k $\Omega$
Voltage Feedback Ratio		$h_{re}$		0.5	-	8.0	$\times 10^{-4}$
Small-Signal Current Gain		$h_{fe}$		100	-	400	
Collector Output Admittance		$h_{oe}$		1.0	-	40	$\mu\Omega$
Noise Figure		NF		$V_{CE}=5V, I_C=0.1mA, R_g=1k\Omega, f=10Hz \sim 15.7kHz$	-	-	5.0
Switching Time	Delay Time	$t_d$		-	-	35	nS
	Rise Time	$t_r$		-	-	35	
	Storage Time	$t_{stg}$		-	-	200	
	Fall Time	$t_f$		-	-	50	

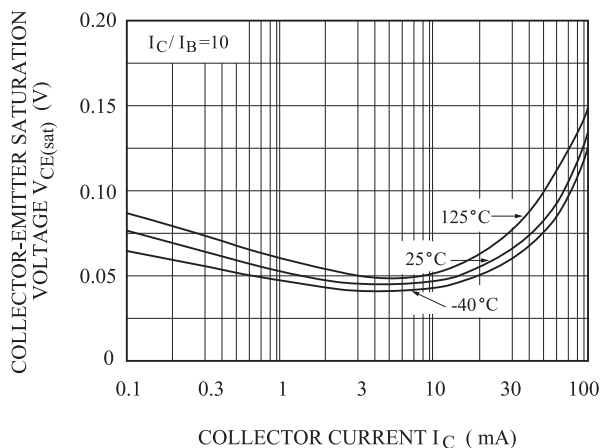
\* Pulse Test : Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .

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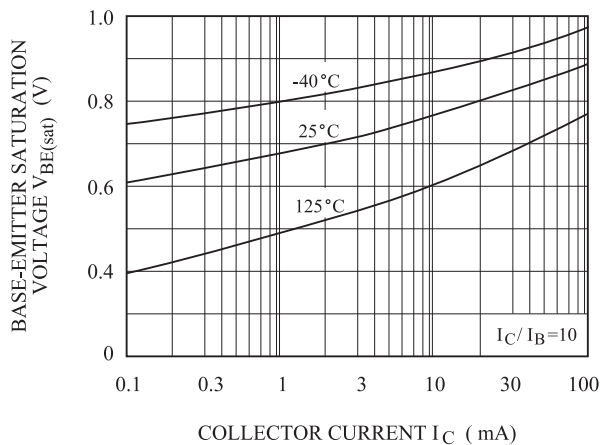
$h_{FE} - I_C$



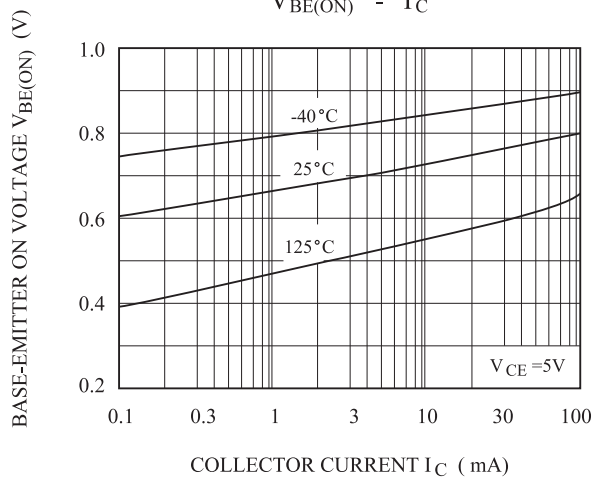
$V_{CE(sat)} - I_C$



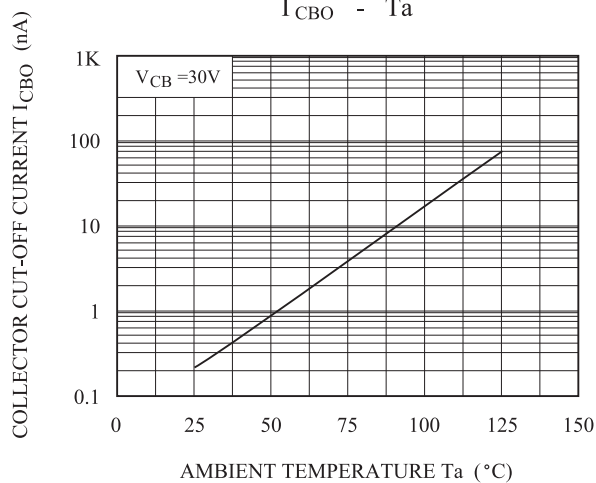
$V_{BE(sat)} - I_C$



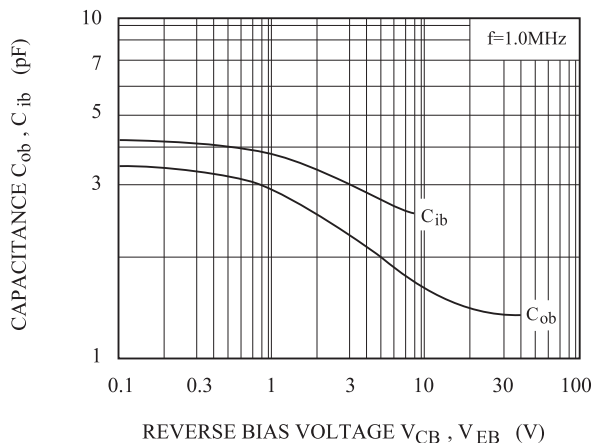
$V_{BE(ON)} - I_C$



$I_{CBO} - T_a$

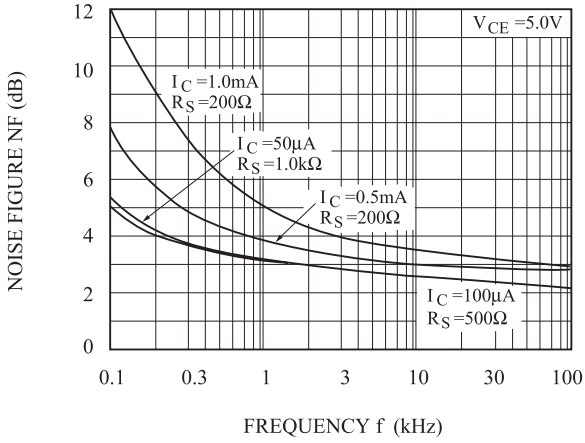


$C_{ob} - V_{CB}, C_{ib} - V_{EB}$

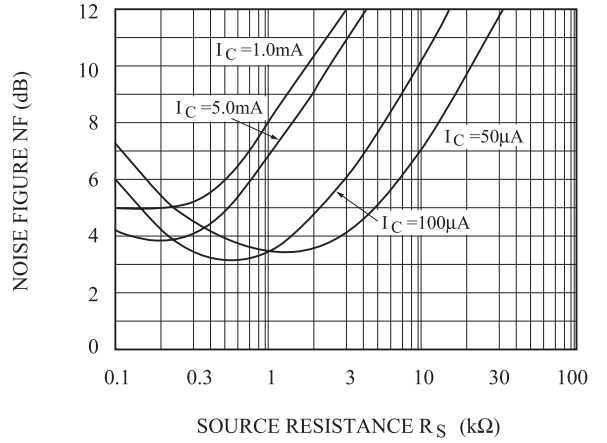


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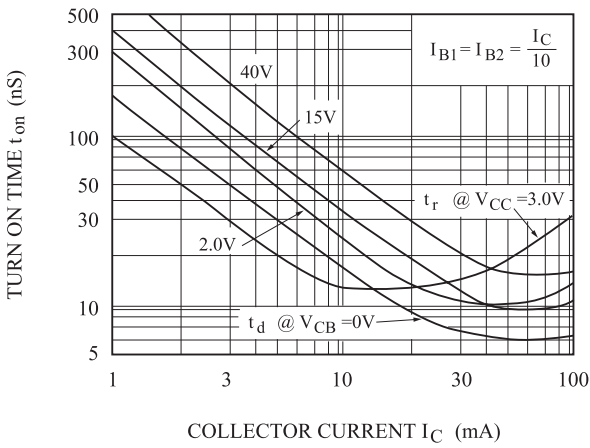
NF - f



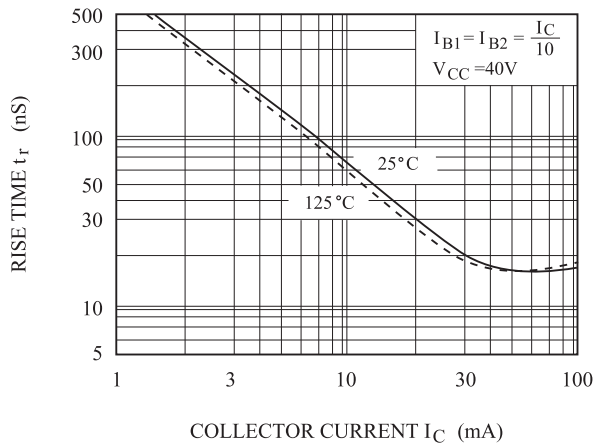
NF -  $R_S$



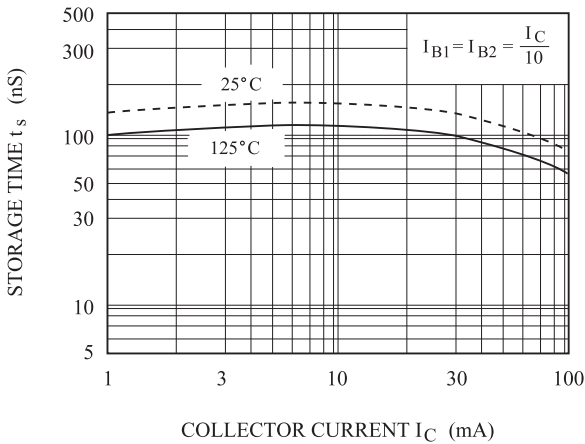
$t_{on}$  -  $I_C$



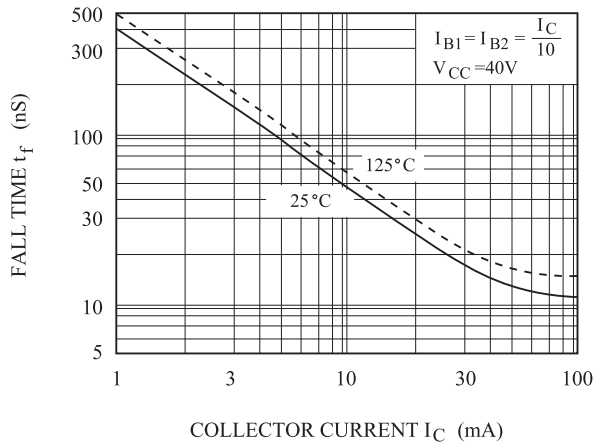
$t_r$  -  $I_C$



$t_s$  -  $I_C$

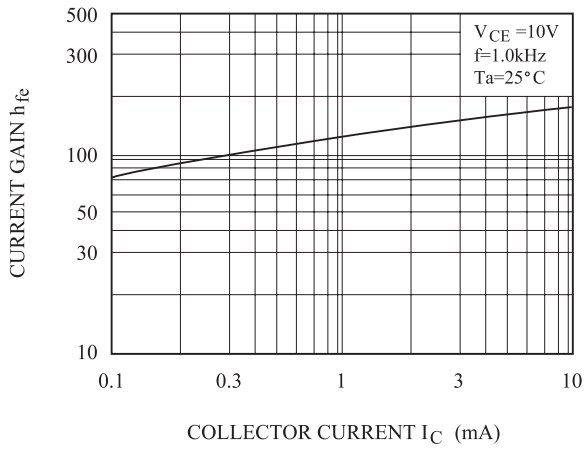


$t_f$  -  $I_C$

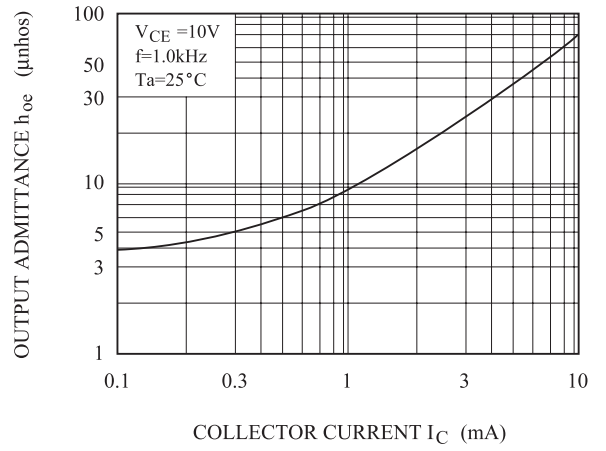


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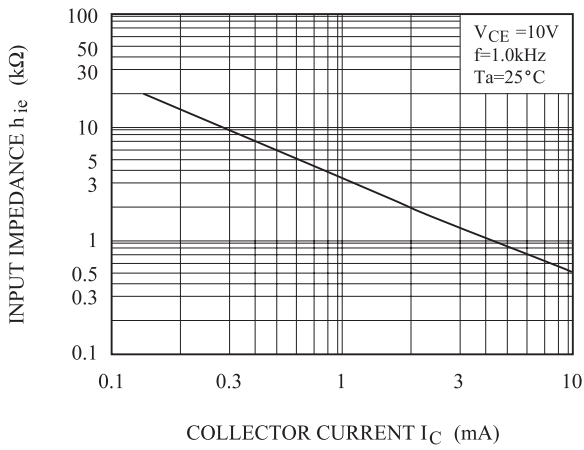
$h_{fe} - I_C$



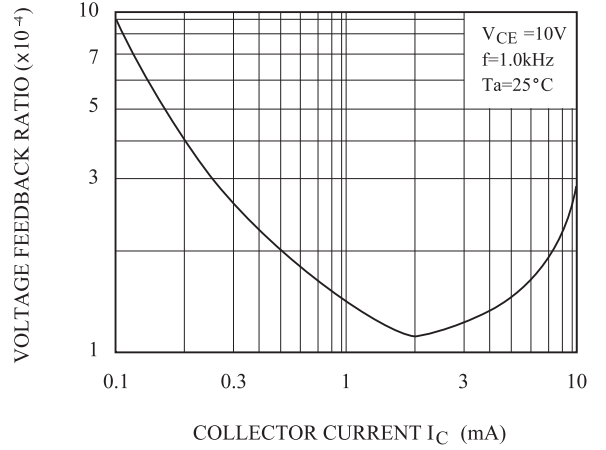
$h_{oe} - I_C$



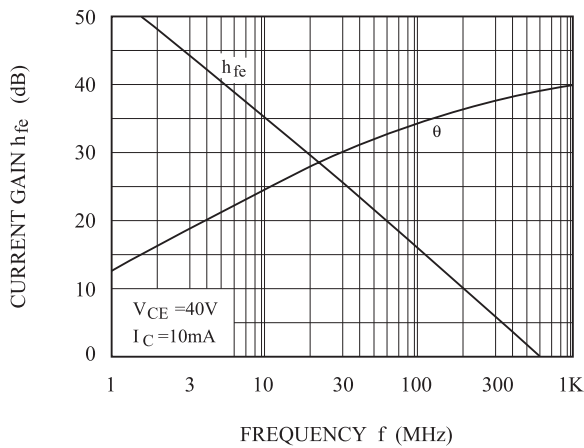
$h_{ie} - I_C$



$h_{re} - I_C$



$h_{fe} - f$



$P_c - T_a$

