TOSHIBA TRANSISTOR

2N3906

SILICON PNP EPITAXIAL TYPE (PCT PROCESS)

TOSHIBA (DISCRETE/OPTO)

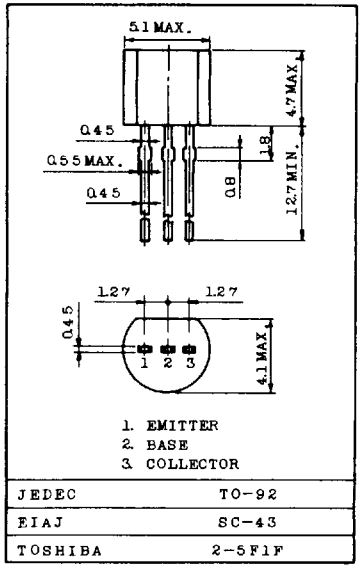
T-31-23

FOR GENERAL PURPOSE USE SWITCHING AND AMPLIFIER APPLICATIONS.

FEATURES:

. Low Leakage Current
  : I_{CEV}=-50nA(Max.), I_{BEV}=50nA(Max.)
  @ V_{CE}=-30V, V_{BE}=3V
. Excellent DC Current Gain Linearity
. Low Saturation Voltage
  : $V_{CE(sat)}$=-0.4V(Max.) @ I_C=-50mA, I_B=-5mA
. Low Collector Output Capacitance
  : C_{ob}=4.5pF(Max.) @ V_{CB}=-5V
. Complementary to 2N3904

Unit in mm



JEDEC	TO-92
EIAJ	SC-43
TOSHIBA	2-5F1F

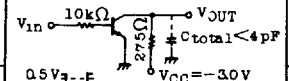
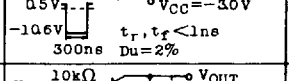
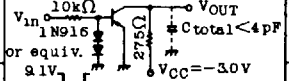
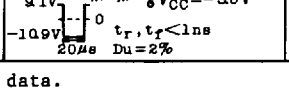
Weight : 0.21g

MAXIMUM RATINGS (Ta=25°C)

	CHARACTERISTIC	SYMBOL	RATING	UNIT
※	Collector-Base Voltage	V_{CBO}	-40	V
※	Collector-Emitter Voltage	V_{CEO}	-40	V
※	Emitter-Base Voltage	V_{EBO}	-5	V
※	Collector Current	I_C	-200	mA
	Base Current	I_B	-50	mA
※	Collector Power Dissipation (Ta=25°C) Derate Linearly 25°C	P_C	625	mW
			5.0	mW/°C
※	Collector Power Dissipation (Tc=25°C) Derate Linearly 25°C	P_C	1.5	W
			12	mW/°C
※	Thermal Resistance (Junction to Ambient)	$R_{th(j-a)}$	200	°C/W
※	Thermal Resistance (Junction to Case)	$R_{th(j-c)}$	83.3	°C/W
※	Junction Temperature	T_j	150	°C
※	Storage Temperature Range	T_{stg}	-55~150	°C

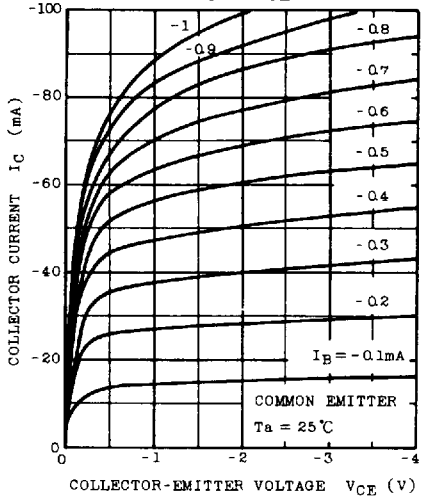
※In accordance with JEDEC registration data.

ELECTRICAL CHARACTERISTICS (Ta=25°C)

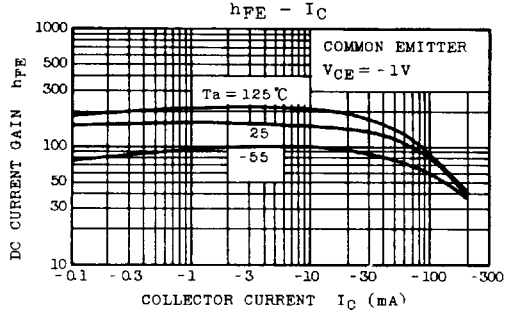
	CHARACTERISTIC		SYMBOL	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
※	Collector Cut-off Current		I_{CEV}	V_{CE}=-30V, V_{BE}=3V	-	-	-50	nA
※	Base Cut-off Current		I_{BEV}	V_{CE}=-30V, V_{BE}=3V	-	-	50	nA
※	Collector-Base Breakdown Voltage		$V_{(BR)CBO}$	I_C=-10μA, I_E=0	-40	-	-	V
※	Collector-Emitter Breakdown Voltage		$V_{(BR)CEO}$	I_C=-1mA, I_B=0	-40	-	-	V
※	Emitter-Base Breakdown Voltage		$V_{(BR)EBO}$	I_E=-10μA, I_C=0	-5	-	-	V
	DC Current Gain		$h_{FE(1)}$	V_{CE}=-1V, I_C=-0.1mA	60	-	-	
			$h_{FE(2)}$	V_{CE}=-1V, I_C=-1mA	80	-	-	
			$h_{FE(3)}$	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	-	-	
※	Collector-Emitter Saturation Voltage		$V_{CE(sat)1}$	I_C=-10mA, I_B=-1mA	-	-	-0.25	V
			$V_{CE(sat)2}$	I_C=-50mA, I_B=-5mA	-	-	-0.4	
※	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	250	-	-	MHz
※	Collector Output Capacitance		C_{ob}	V_{CB}=-5V, I_E=0, f=1MHz	-	-	4.5	pF
※	Input Capacitance		C_{ib}	V_{EB}=-0.5V, I_C=0, f=1MHz	-	-	10	pF
※	Input Impedance		h_{ie}	V_{CE}=-10V, I_C=-1mA f=1kHz	2.0	-	12	kΩ
※	Voltage Feedback Ratio		h_{re}		1.0	-	10	×10-4
※	Small-Signal Current Gain		h_{fe}		100	-	400	
※	Collector Output Admittance		h_{oe}		3.0	-	60	μS
※	Noise Figure		NF	V_{CE}=-5V, I_C=-0.1mA R_g=1kΩ, f=10Hz~15.7kHz	-	-	4	dB
※	Switching Time	Delay Time	t_d		-	-	35	ns
		Rise Time	t_r		-	-	35	
		Storage Time	t_{stg}		-	-	225	
		Fall Time	t_f		-	-	75	

※ In accordance with JEDEC registration data.

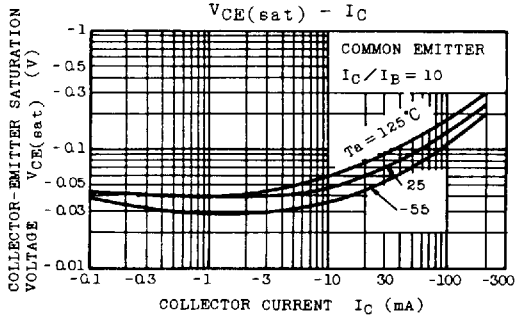
$I_C - V_{CE}$



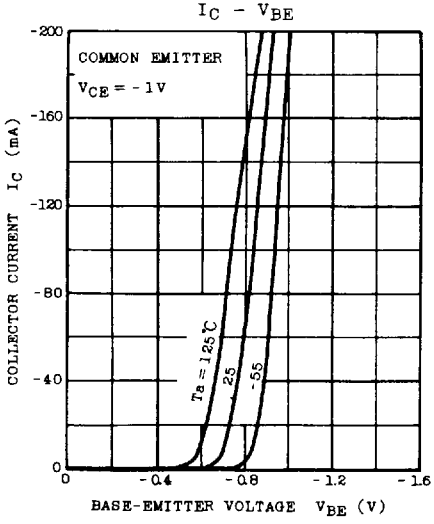
$h_{FE} - I_C$



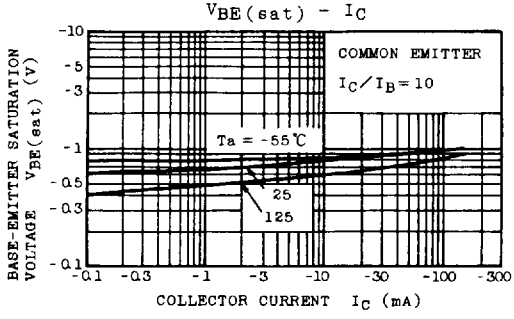
$V_{CE(sat)} - I_C$

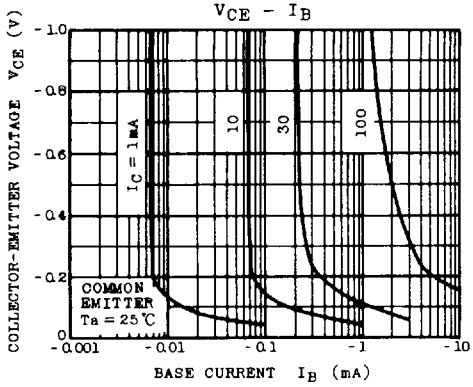


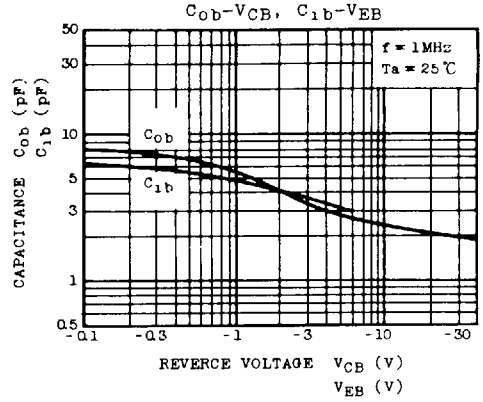
$I_C - V_{BE}$

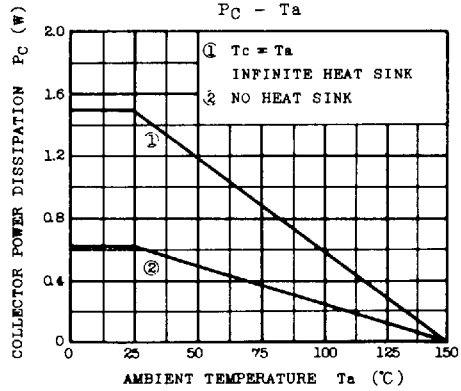


$V_{BE(sat)} - I_C$




V_{CE} - I_B
COLLECTOR-EMITTER VOLTAGE V_{CE} (V)
-1.0
-0.8
-0.6
-0.4
-0.2
0
I_C = 1mA
10
30
100
COMMON EMITTER
Ta = 25℃
-0.001
-0.01
-0.1
-1
-10
BASE CURRENT I_B (mA)


C_{ob}-V_{CB}, C_{ib}-V_{EB}
CAPACITANCE C_{ob} (pF) C_{ib} (pF)
50
30
10
5
3
1
0.5
f = 1MHz
Ta = 25℃
C_{ob}
C_{ib}
-0.1
-0.3
-1
-3
-10
-30
REVERCE VOLTAGE V_{CB} (V)
V_{EB} (V)


P_C - Ta
COLLECTOR POWER DISSIPATION P_C (W)
2.0
1.6
1.2
0.8
0.4
0
① Tc = Ta
INFINITE HEAT SINK
② NO HEAT SINK
①
②
0
25
50
75
100
125
150
AMBIENT TEMPERATURE Ta (℃)