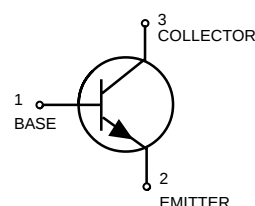
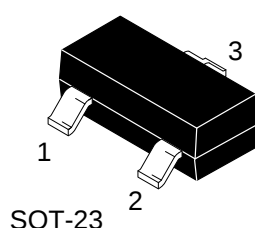


General Purpose Transistors NPN Silicon

FEATURES:

- We declare that the material of product compliance with RoHS requirements.

Circuit Diagram & Pin Configuration:



DEVICE MARKING AND ORDERING INFORMATION

Device	Marking	Shipping
TMBT3904	1AM	3000/Tape&Reel

● MAXIMUM RATINGS(Ta = 25°C)

Parameter	Symbol	Limits	Unit
Collector–Emitter Voltage	V _{CEO}	40	Vdc
Collector–Base Voltage	V _{CBO}	60	Vdc
Emitter–Base Voltage	V _{EB0}	6	Vdc
Collector Current — Continuous	I _C	200	mAdc

● THERMAL CHARACTERISTICS

Total Device Dissipation, FR-5 Board (Note 1) @ T _A = 25°C Derate above 25°C	P _D	225 1.8	mW mW/°C
Thermal Resistance, Junction–to–Ambient(Note 1)	R _{θJA}	556	°C/W
Total Device Dissipation, Alumina Substrate (Note 2) @ T _A = 25°C Derate above 25°C	P _D	300 2.4	mW mW/°C
Thermal Resistance, Junction–to–Ambient(Note 2)	R _{θJA}	417	°C/W
Junction and Storage temperature	T _J ,T _{stg}	–55 ~ +150	°C

1. FR-5 = 1.0×0.75×0.062 in.

2. Alumina = 0.4×0.3×0.024 in. 99.5% alumina.

● ELECTRICAL CHARACTERISTICS (Ta= 25°C)
OFF CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Collector–Emitter Breakdown Voltage (I _C = 1.0 mA _{dc} , I _B = 0)	V _{BR} (CEO)	40	–	–	V
Collector–Base Breakdown Voltage (I _C = 10 μA _{dc} , I _E = 0)	V _{BR} (CBO)	60	–	–	V
Emitter–Base Breakdown Voltage (I _E = 10 μA _{dc} , I _C = 0)	V _{BR} (EBO)	6	–	–	V
Collector Cutoff Current (V _{CE} = 30 V _{dc} , V _{EB} = 3.0V _{dc})	I _C EX	–	–	50	nA
Base Cutoff Current (V _{CE} = 30 V _{dc} , V _{EB} = 3.0 V _{dc})	I _{BL}	–	–	50	nA

ON CHARACTERISTICS (Note 3.)

DC Current Gain (I _C = 0.1 mA _{dc} , V _{CE} = 1.0 V _{dc}) (I _C = 1.0 mA _{dc} , V _{CE} = 1.0 V _{dc}) (I _C = 10 mA _{dc} , V _{CE} = 1.0 V _{dc}) (I _C = 50 mA _{dc} , V _{CE} = 1.0 V _{dc}) (I _C = 100 mA _{dc} , V _{CE} = 1.0 V _{dc})	h _{FE}	40 70 100 60 30	– – – – –	– – 300 – –	
Collector–Emitter Saturation Voltage(3) (I _C = 10 mA _{dc} , I _B = 1.0 mA _{dc}) (I _C = 50mA _{dc} , I _B = 5.0 mA _{dc})	V _{CE} (sat)	– –	– –	0.2 0.3	V
Base–Emitter Saturation Voltage (I _C = 10 mA _{dc} , I _B = 1.0 mA _{dc}) (I _C = 50mA _{dc} , I _B = 5.0 mA _{dc})	V _{BE} (sat)	0.65 –	– –	0.85 0.95	V

SMALL–SIGNAL CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Current–Gain — Bandwidth Product (I _C = 10mA _{dc} , V _{CE} = 20V _{dc} , f = 100MHz)	f _T	300	–	–	MHz
Output Capacitance (V _{CB} = 5.0 V _{dc} , I _E = 0, f = 1.0 MHz)	C _{obo}	–	–	4	pF
Input Capacitance (V _{EB} = 0.5 V _{dc} , I _C = 0, f = 1.0 MHz)	C _{ibo}	–	–	8	pF
Input Impedance (V _{CE} = 10 V _{dc} , I _C = 1.0 mA _{dc} , f = 1.0 kHz)	h _{ie}	1	–	10	kΩ
Voltage Feedback Ratio (V _{CE} = 10 V _{dc} , I _C = 1.0 mA _{dc} , f = 1.0 kHz)	h _{re}	0.5	–	8	X 10 ^{–4}
Small–Signal Current Gain (V _{CE} = 10 V _{dc} , I _C = 1.0 mA _{dc} , f = 1.0 kHz)	h _{fe}	100	–	400	
Output Admittance (V _{CE} = 10 V _{dc} , I _C = 1.0 mA _{dc} , f = 1.0 kHz)	h _{oe}	1	–	40	μmhos
Noise Figure (V _{CE} =5V, I _C =100μA, R _S =1.0kΩ, f=1.0kHz)	NF	–	–	5	dB

3. Pulse Test: Pulse Width <300 μs, Duty Cycle <2.0%.

●ELECTRICAL CHARACTERISTICS (Ta= 25℃)

SWITCHING CHARACTERISTICS

Delay Time	(V _{CC} = 3.0 Vdc, V _{BE} = -0.5 Vdc, I _C = 10 mAdc, I _{B1} = 1.0 mAdc)	t _d	—	—	35	ns
Rise Time		t _r	—	—	35	
Storage Time	(V _{CC} = 3.0 Vdc, I _C = 10 mAdc, I _{B1} = I _{B2} = 1.0 mAdc)	t _s	—	—	200	
Fall Time		t _f	—	—	50	

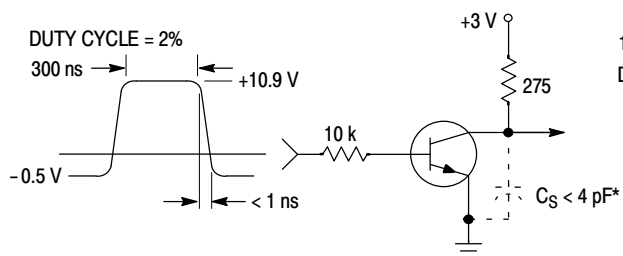


Figure 1. Delay and Rise Time
Equivalent Test Circuit

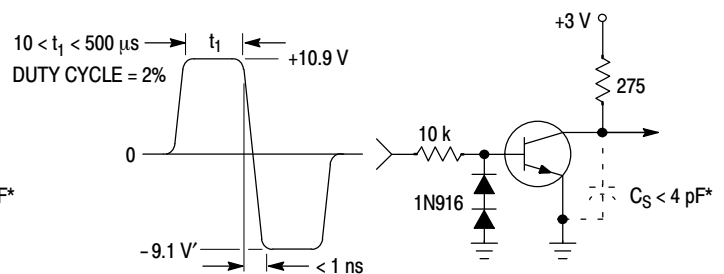


Figure 2. Storage and Fall Time
Equivalent Test Circuit

* Total shunt capacitance of test jig and connectors

ELECTRICAL CHARACTERISTICS CURVES

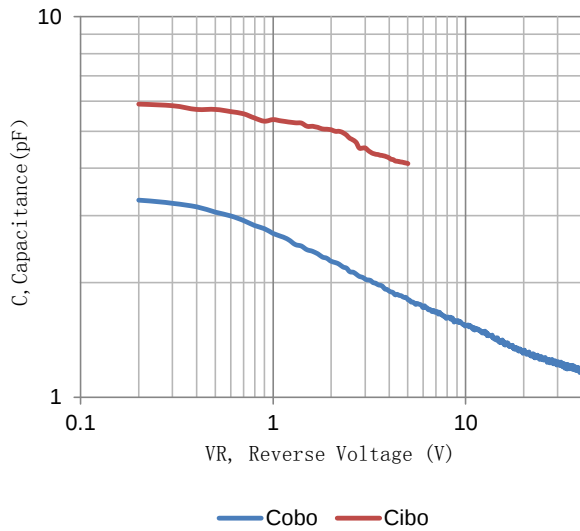


Figure 3. Capacitance

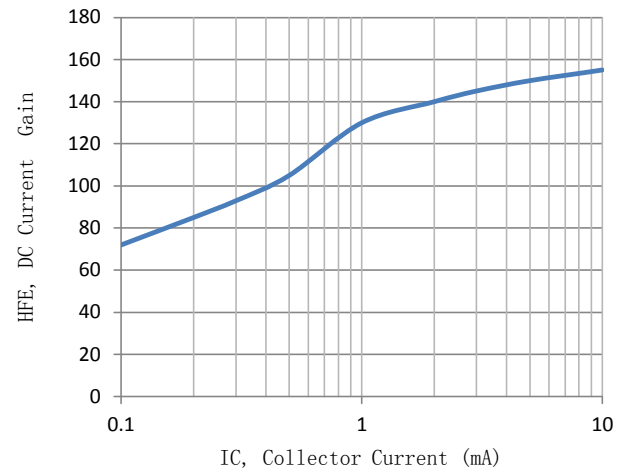


Figure 4. Current Gain

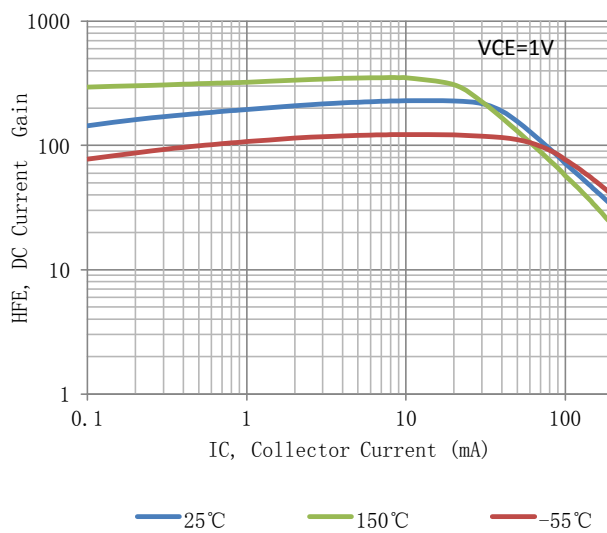


Figure 5. DC Current Gain

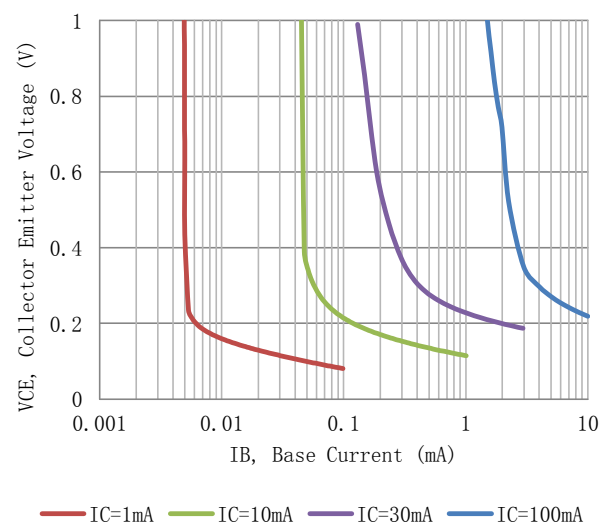


Figure 6. Collector Saturation Region

ELECTRICAL CHARACTERISTICS CURVES

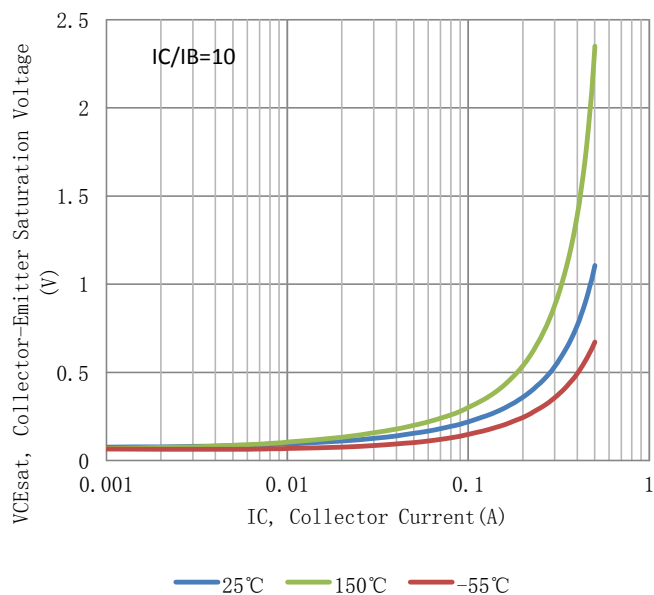


Figure 7. $V_{CE(sat)}$ vs I_C

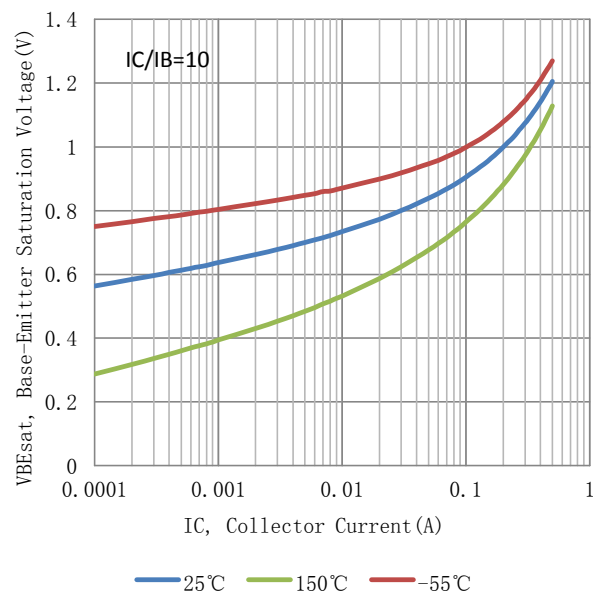


Figure 8. $V_{BE(sat)}$ vs I_C

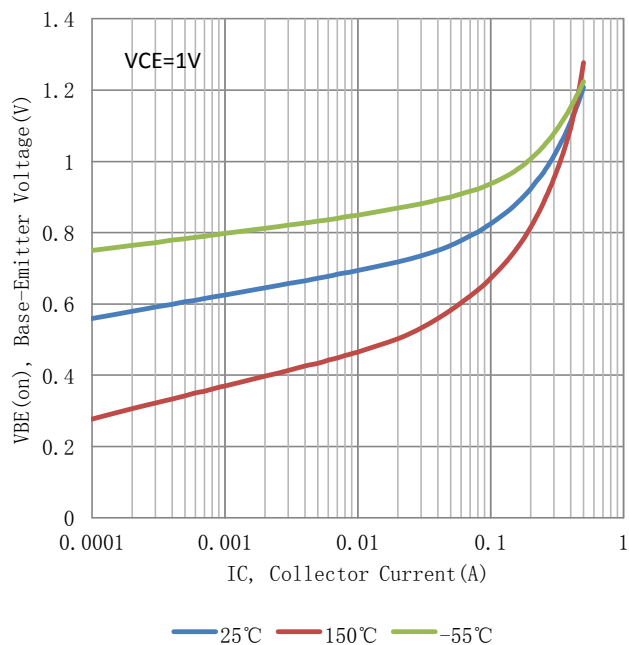
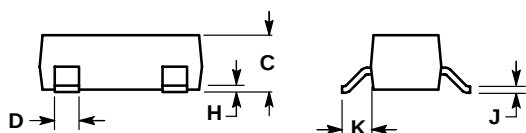
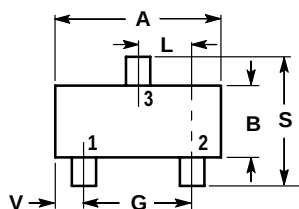


Figure 9. $V_{BE(on)}$ vs I_C

SOT-23

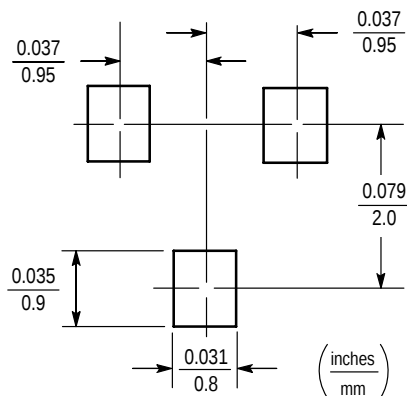


NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.50
G	0.0701	0.0807	1.78	2.04
H	0.0005	0.0040	0.013	0.100
J	0.0034	0.0070	0.085	0.177
K	0.0140	0.0285	0.35	0.69
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.1039	2.10	2.64
V	0.0177	0.0236	0.45	0.60

- PIN 1. BASE
2. EMITTER
3. COLLECTOR



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