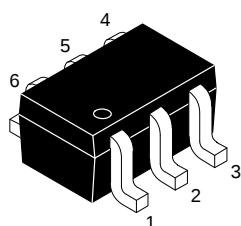


Dual General Purpose Transistors NPN Silicon

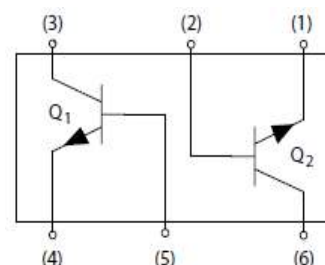
FEATURES:

- We declare that the material of product is ROHS compliant and halogen free.
- Low $V_{CE(sat)}$, $\leq 0.4\text{ V}$
- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count

Circuit Diagram & Pin Configuration:



SOT363/SC-88



DEVICE MARKING AND ORDERING INFORMATION

Device	Marking	Shipping
TMBT3904DW	MA	3000/Tape&Reel

● MAXIMUM RATINGS($T_a = 25^\circ\text{C}$)

Parameter	Symbol	Limits	Unit
Collector–Emitter Voltage	V_{CEO}	40	Vdc
Collector–Base Voltage	V_{CBO}	60	Vdc
Emitter–Base Voltage	V_{EBO}	6.0	Vdc
Collector Current — Continuous	I_C	200	mAdc

● THERMAL CHARACTERISTICS

Total Device Dissipation, FR-5 Board (Note 1) @ $T_A = 25^\circ\text{C}$	P_D	150	mW
Thermal Resistance, Junction–to–Ambient(Note 1)	$R_{\theta JA}$	833	$^\circ\text{C}/\text{W}$
Junction and Storage temperature	T_J, T_{stg}	$-55 \sim +150$	$^\circ\text{C}$

1. Device mounted on FR4 glass epoxy printed circuit board using the minimum recommended footprint.

● 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 _{CEX}	–	–	50	nA
Base Cutoff Current (V _{CE} = 30 V _{dc} , V _{EB} = 3.0 V _{dc})	I _{BL}	–	–	50	nA

ON CHARACTERISTICS (Note 2.)

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 (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	k Ω
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

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

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

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	

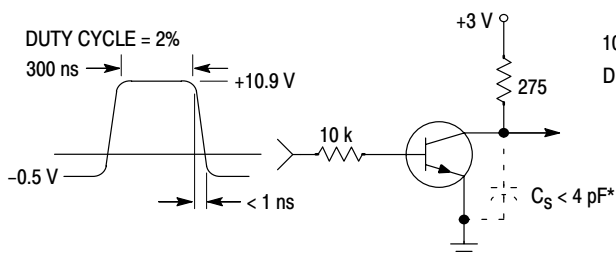


Figure 1. Delay and Rise Time
Equivalent Test Circuit

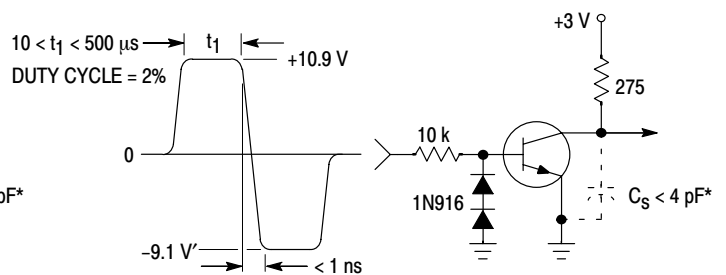
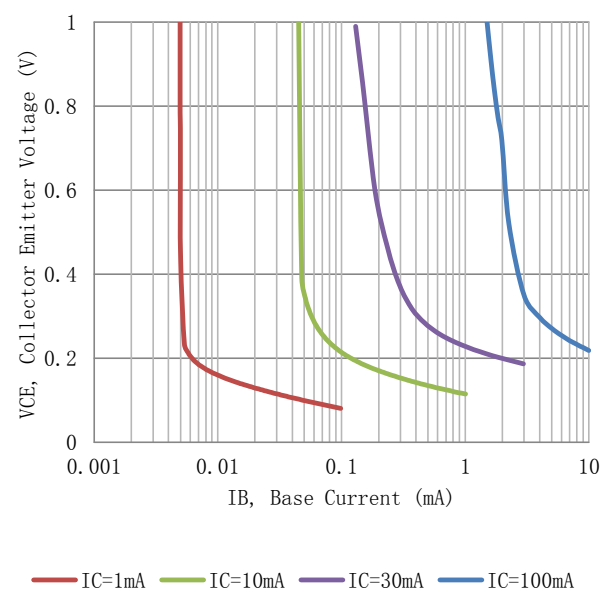
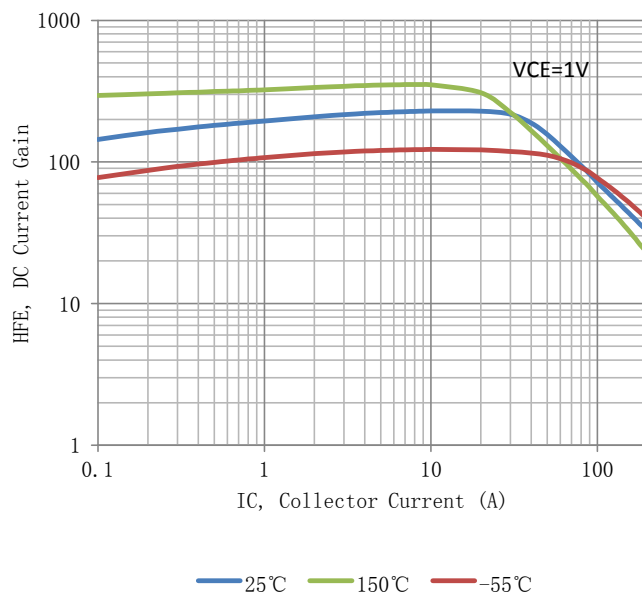
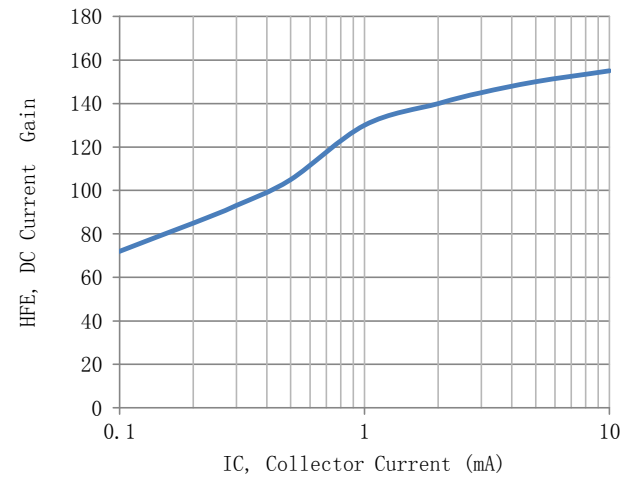
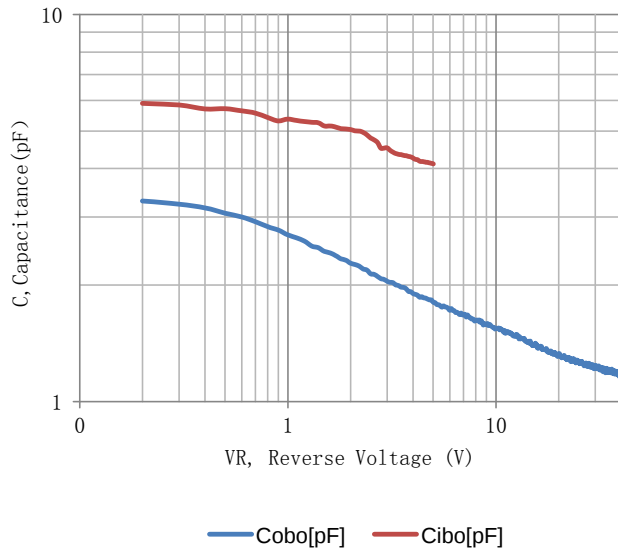


Figure 2. Storage and Fall Time
Equivalent Test Circuit

* Total shunt capacitance of test jig and connectors

ELRCTRICAL CHARACTERISTICS CURVES



ELRCTRICAL CHARACTERISTICS CURVES

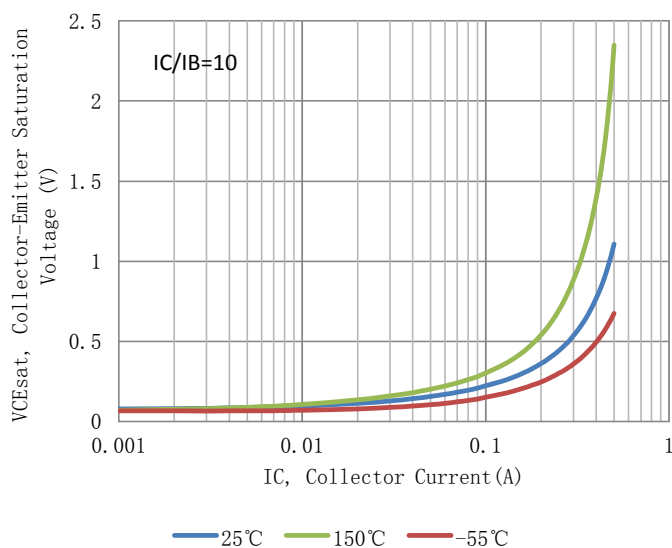


FIG.7 VCE(sat) vs. IC

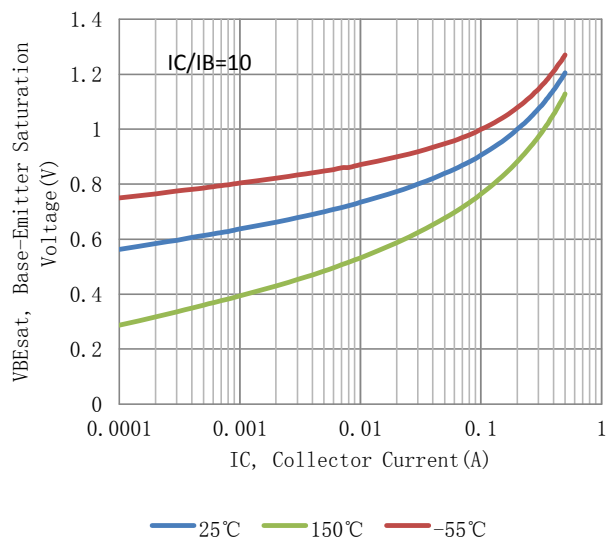


FIG.8 VBE(sat) vs. IC

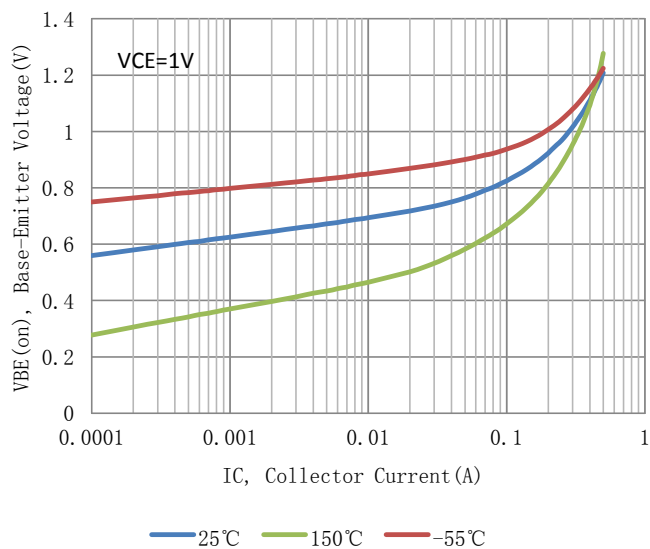
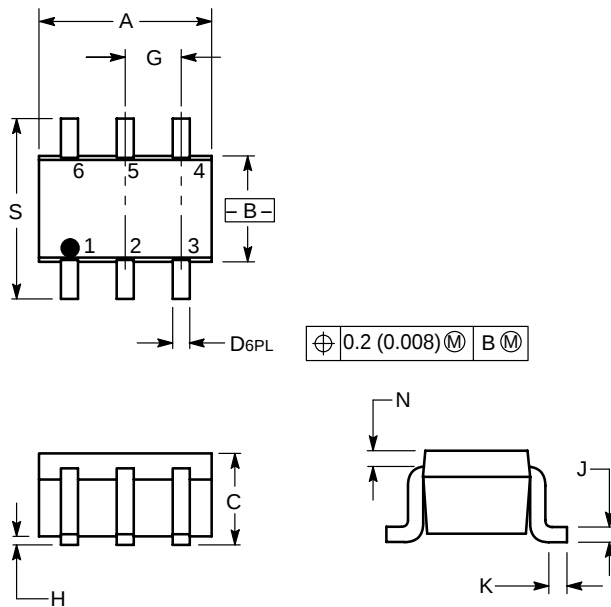


FIG.9 VBE(on) vs. IC

SC-88

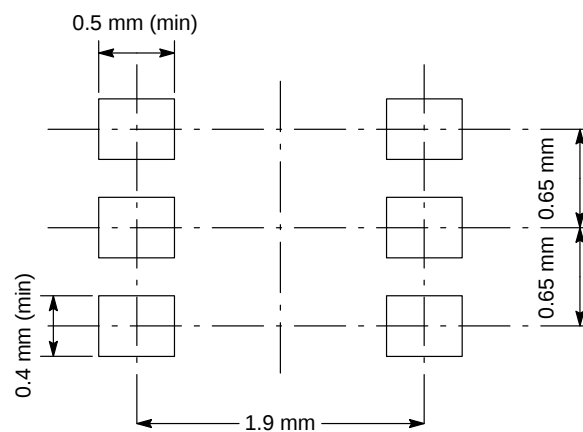
NOTES:

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



DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20

- PIN 1. EMITTER 2
 2. BASE 2
 3. COLLECTOR 1
 4. EMITTER 1
 5. BASE 1
 6. COLLECTOR 2



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