



DESCRIPTION

The MBT3904D device is a spin-off of our popular SOT-23/SOT-323 three-leaded device. It is designed for general purpose amplifier applications and is housed in the SC-88(SOT-363) six-leaded surface mount package. By putting two discrete devices in one package, this device is ideal for low-power surface mount applications where board space is at a premium.

The MBT3904D is available in SC-88 Package.

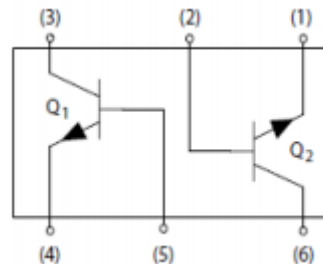
ORDERING INFORMATION

Package Type	Part Number
SC-88	MBT3904D
Note	SPQ: 3,000pcs/Reel
AiT provides all RoHS Compliant Products	

FEATURES

- Low $V_{CE(sat)}$, ≤ 0.4 V
- Simplifies Circuit Design
- Reduces Board Space
- Reduces Component Count
- h_{FE} , 100–300
- Available in SC-88 Package

PIN DESCRIPTION



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



ABSOLUTE MAXIMUM RATINGS

V _{CEO} , Collector-Emitter Voltage	40Vdc
V _{CBO} , Collector-Base Voltage	60Vdc
V _{EBO} , Emitter-Base Voltage	6.0Vdc
I _C , Collector Current — Continuous	200mAdc

Stresses above may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the Electrical Characteristics are not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

THERMAL CHARACTERISTICS

Parameter	Symbol	Max	Unit
Total Device Dissipation, FR-5 Board ^{NOTE1} @T _A = 25°C	P _D	150	mW
Thermal Resistance, Junction-to-Ambient ^{NOTE1}	R _{θJA}	833	°C/W
Junction and Storage Temperature	T _J , T _{STG}	-55~+150	°C

NOTE1: Device mounted on FR4 glass epoxy printed circuit board using the minimum recommended footprint.



ELECTRICAL CHARACTERISTICS

T_A=25°C

Parameter	Symbol	Conditions	Min.	Max.	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage	V _{BR(CEO)}	I _C = 1.0mA, I _B = 0	40	-	V
Collector-Base Breakdown Voltage	V _{(BR)CBO}	I _C = 10μA, I _E = 0	60	-	V
Emitter-Base Breakdown Voltage	V _{(BR)EBO}	I _E = 10μA, I _C = 0	6	-	V
Collector Cutoff Current	I _{CEx}	V _{CE} = 30Vdc, V _{EB} = 3.0Vdc	-	50	nA
Base Cutoff Current	I _{BL}	V _{CE} = 30Vdc, V _{EB} = 3.0Vdc	-	50	nA
ON CHARACTERISTICS NOTE2					
DC Current Gain	h _{FE}	I _C = 0.1mA, V _{CE} = 1.0Vdc	40	-	
		I _C = 1.0mA, V _{CE} = 1.0Vdc	70	-	
		I _C = 10mA, V _{CE} = 1.0Vdc	100	300	
		I _C = 50mA, V _{CE} = 1.0Vdc	60	-	
		I _C = 100mA, V _{CE} = 1.0Vdc	30	-	
Collector-Emitter Saturation Voltage	V _{CE(sat)}	I _C = 10mA, I _B = 1.0mA	-	0.2	V
		I _C = 50mA, I _B = 5.0mA	-	0.3	
Base-Emitter Saturation Voltage	V _{BE(sat)}	I _C = 10mA, I _B = 1.0mA	-	0.85	V
		I _C = 50mA, I _B = 5.0mA	-	0.95	
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain-Bandwidth Product	f _T	I _C = 10mA, V _{CE} = 20Vdc, f = 100MHz	300	-	MHz
Output Capacitance	C _{obo}	V _{CB} = 5.0Vdc, I _E = 0, f = 1.0MHz	-	4	pF
Input Capacitance	C _{ibo}	V _{EB} = 0.5Vdc, I _C = 0, f = 1.0 MHz	-	8	pF
Input Impedance	h _{ie}	V _{CE} = 10Vdc, I _C = 1.0mA, f = 1.0 kHz	1	10	kΩ
Voltage Feedback Ratio	h _{re}	V _{CE} = 10Vdc, I _C = 1.0mA, f = 1.0 kHz	0.5	8	x10 ⁻⁴
Small-Signal Current Gain	h _{fe}	V _{CE} = 10Vdc, I _C = 1.0mA, f = 1.0 kHz	100	400	
Output Admittance	h _{oe}	V _{CE} = 10Vdc, I _C = 1.0mA, f = 1.0 kHz	1	40	μmhos
Noise Figure	NF	V _{CE} = 5V, I _C = 100μA, R _S = 1.0k, f = 1.0kHz	-	5	dB
SWITCHING CHARACTERISTICS					
Delay Time	t _d	V _{CC} = 3.0Vdc, V _{BE} = -0.5Vdc	-	35	ns
Rise Time	t _r	I _C = 10mA, I _{B1} = 1.0mA	-	35	
Storage Time	t _s	V _{CC} = 3.0Vdc, I _C = 10mA,	-	200	ns
Fall Time	t _f	I _{B1} = I _{B2} = 1.0mA	-	50	

NOTE2: Pulse Test: Pulse Width <300 μs, Duty Cycle <2.0%.



TYPICAL CHARACTERISTICS

Figure 1. Delay and Rise Time Equivalent Test Circuit

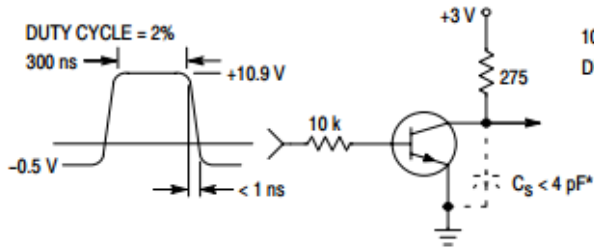
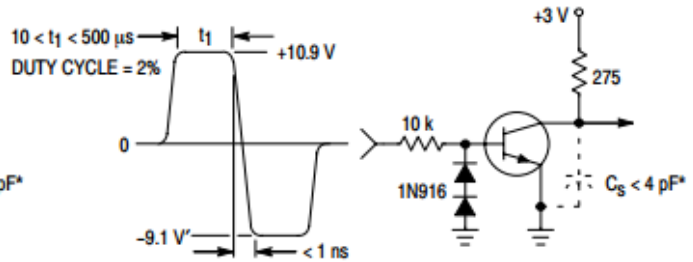


Figure 2. Storage and Fall Time Equivalent Test Circuit



* Total shunt capacitance of test jig and connectors

Figure 3. Capacitance

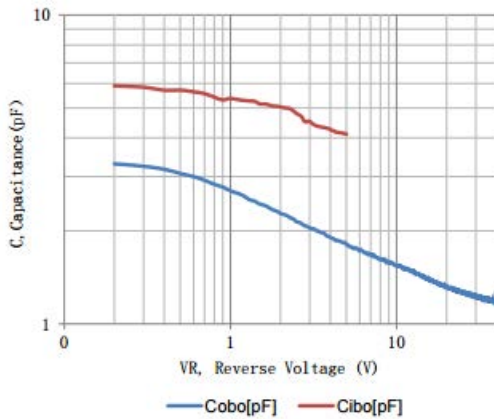


Figure 4. Current Gain

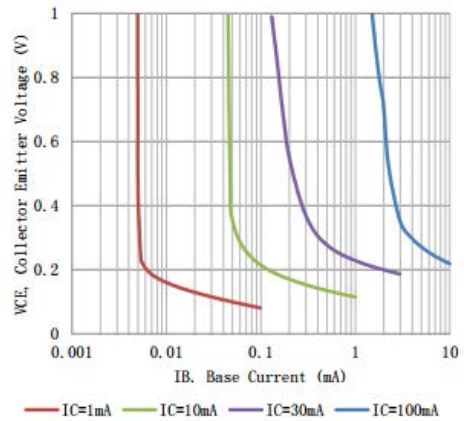


Figure 5. DC Current Gain

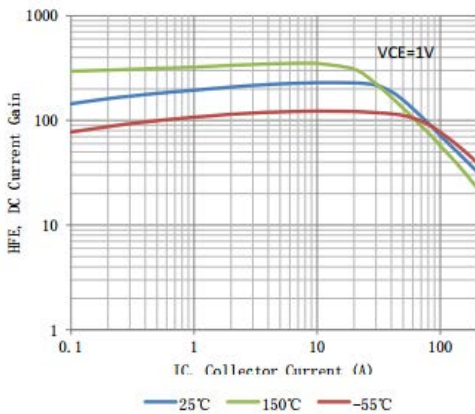


Figure 6. Collector Saturation Region

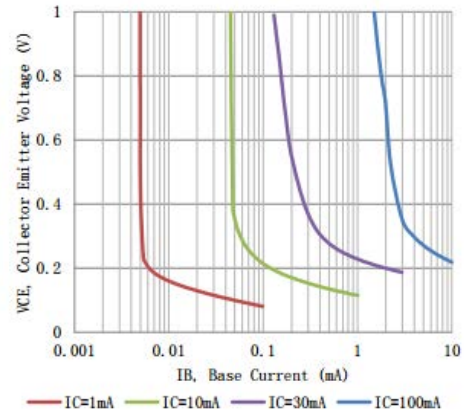




Figure 7. $V_{CE(sat)}$ vs. I_c

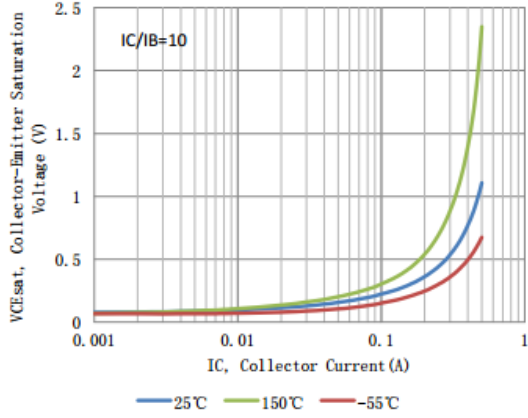


Figure 8. $V_{BE(sat)}$ vs. I_c

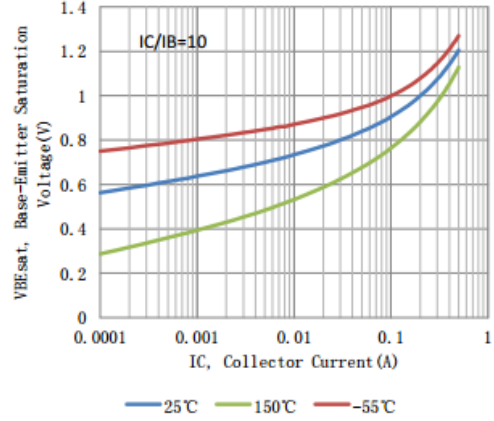
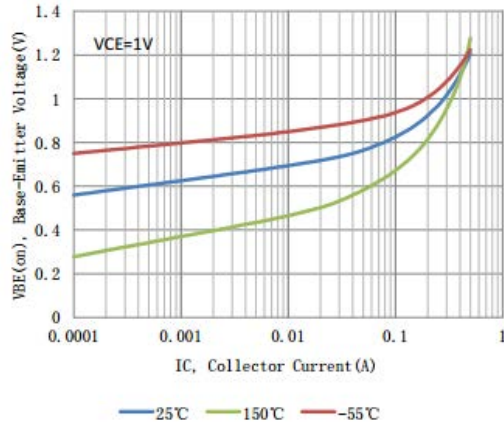


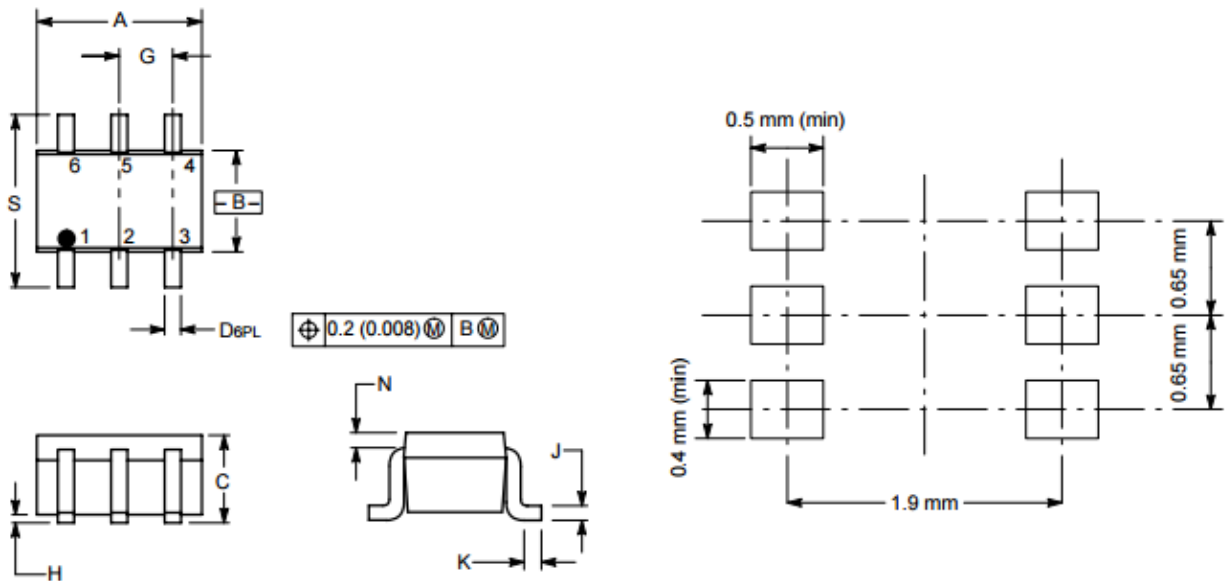
Figure 9. $V_{BE(on)}$ vs. I_c





PACKAGE INFORMATION

Dimension in SC-88 Package (Unit: mm)



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



IMPORTANT NOTICE

AiT Components (AiT) reserves the right to make changes to any its product, specifications, to discontinue any integrated circuit product or service without notice, and advises its customers to obtain the latest version of relevant information to verify, before placing orders, that the information being relied on is current.

AiT Components' integrated circuit products are not designed, intended, authorized, or warranted to be suitable for use in life support applications, devices or systems or other critical applications. Use of AiT products in such applications is understood to be fully at the risk of the customer. As used herein may involve potential risks of death, personal injury, or severe property, or environmental damage. In order to minimize risks associated with the customer's applications, the customer should provide adequate design and operating safeguards.

AiT Components assumes no liability to customer product design or application support. AiT warrants the performance of its products of the specifications applicable at the time of sale.