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.

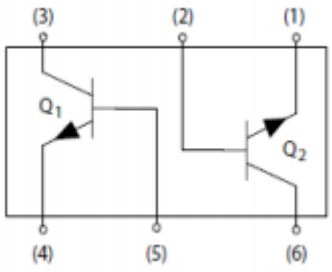
FEATURES

- 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

ORDERING INFORMATION

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

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	$R_{\theta JA}$	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 = 1.0mAdc, I_B = 0	40	-	V
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	I_C = 10μAdc, I_E = 0	60	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	I_E = 10μAdc, 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 = 0.1mAdc, V_{CE} = 1.0Vdc	40	-	
		I_C = 1.0mAdc, V_{CE} = 1.0Vdc	70	-	
		I_C = 10mAdc, V_{CE} = 1.0Vdc	100	300	
		I_C = 50mAdc, V_{CE} = 1.0Vdc	60	-	
		I_C = 100mAdc, V_{CE} =1.0Vdc	30	-	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 10mAdc, I_B = 1.0mAdc	-	0.2	V
		I_C = 50mAdc, I_B = 5.0mAdc	-	0.3	
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	I_C = 10mAdc, I_B = 1.0mAdc	-	0.85	V
		I_C = 50mAdc, I_B = 5.0mAdc	-	0.95	
SMALL–SIGNAL CHARACTERISTICS					
Current-Gain-Bandwidth Product	f_T	I_C = 10mAdc, 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 = 1.0mAdc, f = 1.0 kHz	1	10	kΩ
Voltage Feedback Ratio	h_{re}	V_{CE}= 10Vdc, I_C = 1.0mAdc, f = 1.0 kHz	0.5	8	$x10^{-4}$
Small–Signal Current Gain	h_{fe}	V_{CE}= 10Vdc, I_C = 1.0mAdc, f = 1.0 kHz	100	400	
Output Admittance	h_{oe}	V_{CE}= 10Vdc, I_C = 1.0mAdc, 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 = 10mAdc, I_{B1} = 1.0mAdc	-	35	
Storage Time	t_s	V_{CC} = 3.0Vdc, I_C = 10mAdc,	-	200	ns
Fall Time	t_f	I_{B1} = I_{B2} = 1.0mAdc	-	50	

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

TYPICAL CHARACTERISTICS

Figure 1. Delay and Rise Time Equivalent Test Circuit

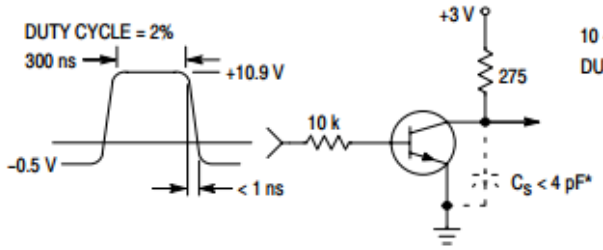
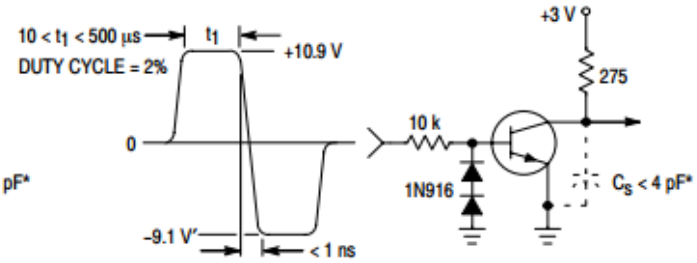


Figure 2. Storage and Fall Time Equivalent Test Circuit



* Total shunt capacitance of test jig and connectors

Figure 3. Capacitance

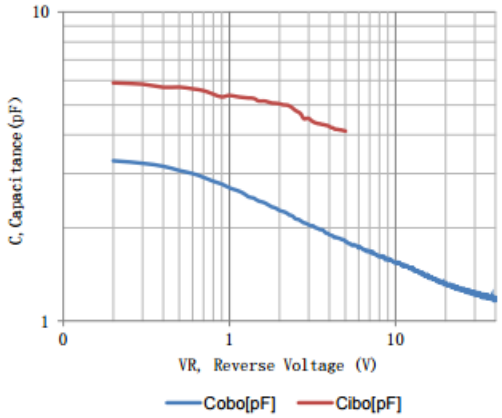


Figure 4. Current Gain

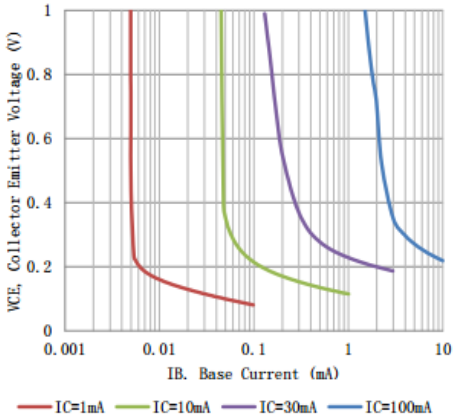


Figure 5. DC Current Gain

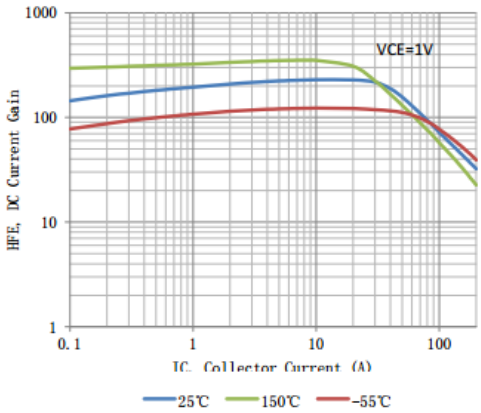


Figure 6. Collector Saturation Region

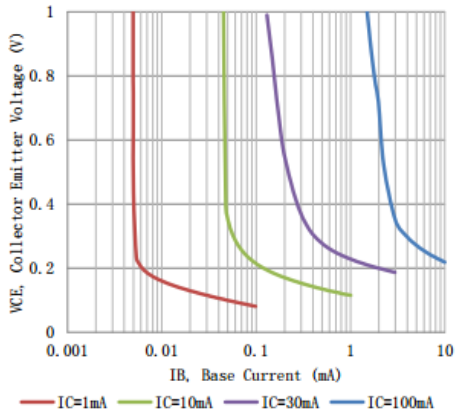


Figure 7. $V_{CE(sat)}$ vs. I_C

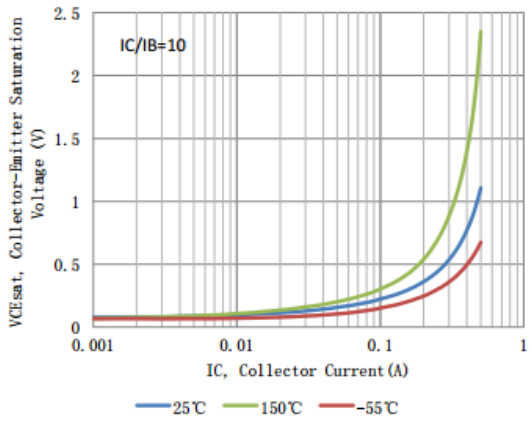


Figure 8. $V_{BE(sat)}$ vs. I_C

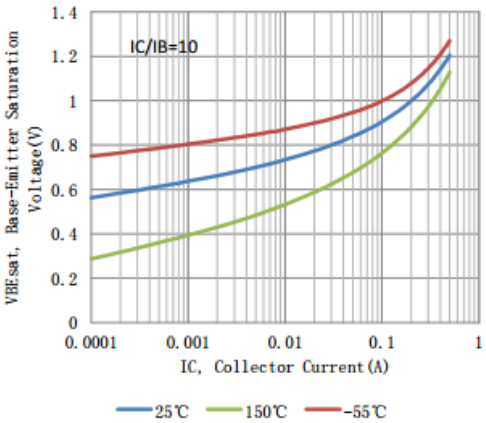
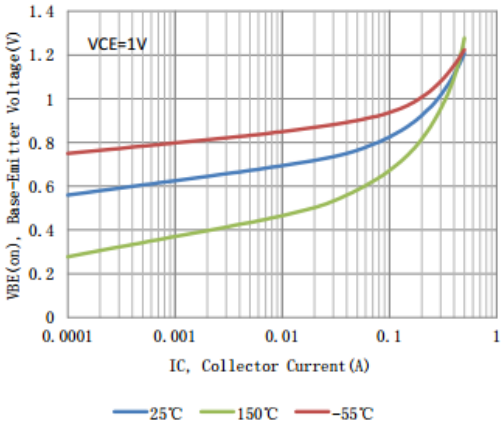
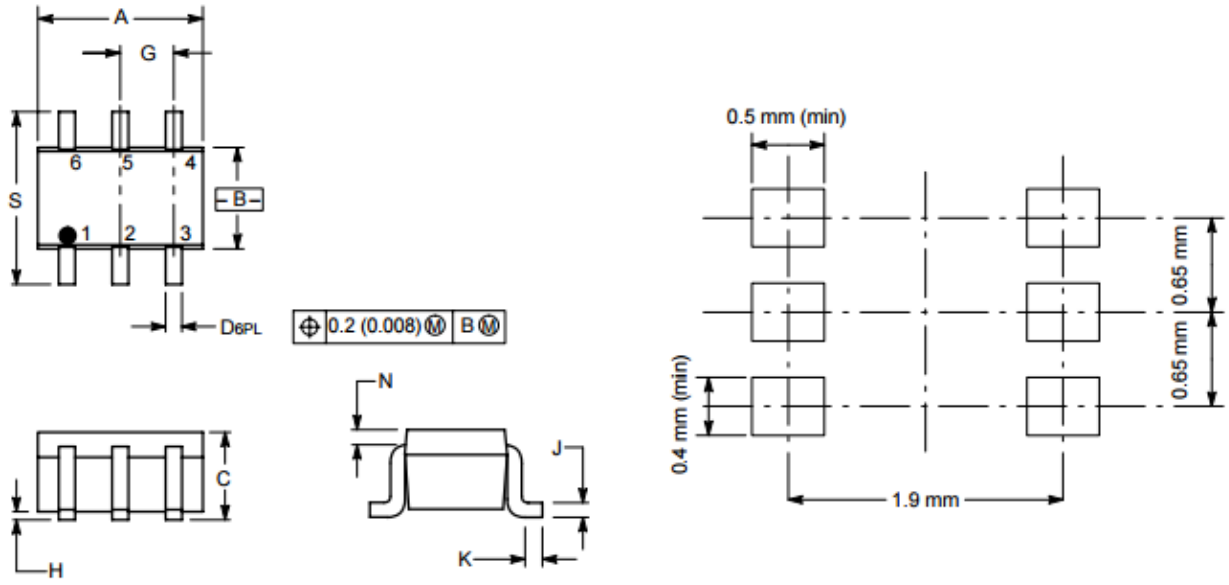


Figure 9. $V_{BE(on)}$ vs. I_C



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

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