NPN Transistor
40V 0.2A 225 mW SOT-23

MMBT3904

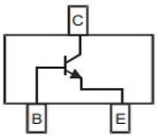
MERITEK

FEATURE

- Storage temperature: -55~+150°C
- Collector current: 200mA

MECHANICAL DATA

- Case: SOT-23. molded plastic
- Terminals: Solderable per MIL-STD-750, Method 2026



RoHS

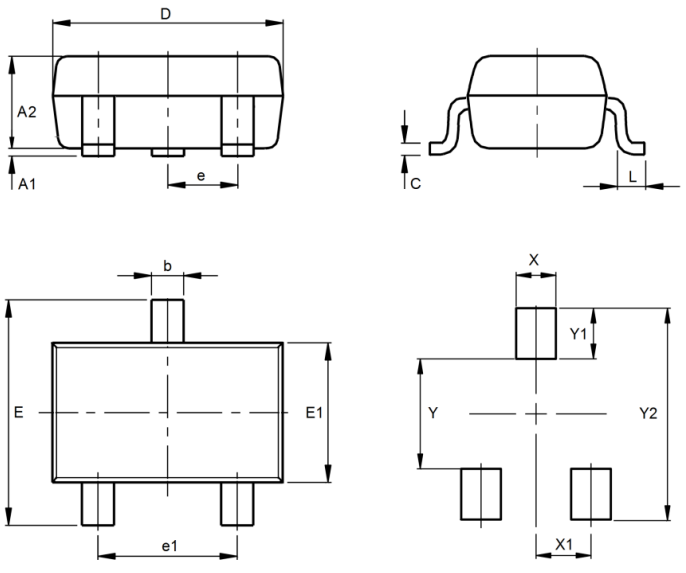
MAXIMUM RATING (TA=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Collector-Base Voltage	V_{CBO}	60	V
Collector-Emitter Voltage	V_{CEO}	40	V
Emitter-Base Voltage	V_{EBO}	6.0	V
Collector Current	I_C	200	mA
Total Device Dissipation FR– 5 Board	P_D	225	mW
Derate above 25°C		1.8	mW/°C
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	556	°C/W
Total Device Dissipation Alumina Substrate	P_D	300	mW
		2.4	mW/°C
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	417	°C/W
Junction and Storage Temperature Range	T_J, T_{stg}	-55 to +150	°C

Note:
1. Device on FR–5 = 1.0 x 0.75 x 0.062 in.
2. Device on alumina substrate = 0.4 x 0.3 x 0.024 in. 99.5% alumina

DIMENSIONS AND RECOMMENDED LAND PATTERN

Item	Min (mm)	Max (mm)
A1	0.013	0.10
A2	0.89	1.20
b	0.37	0.51
c	0.08	0.19
D	2.80	3.04
e	0.89	1.02
e1	1.78	2.04
E	2.20	2.60
E1	1.20	1.40
L	0.20	
X	0.80	
X1	0.95	
Y	-	
Y1	0.80	
Y2	-	



ELECTRICAL CHARACTERISTICS (TA=25°C unless otherwise noted)

Parameter	Conditions	Symbol	Min.	Max.	Unit
Collector-Base Breakdown Voltage	I_C=10μA, I_E=0	$V_{(BR)CBO}$	60	-	V
Collector-Emitter Breakdown Voltage	I_C=1.0mA, I_B=0	$V_{(BR)CEO}$	40	-	V
Emitter-Base Breakdown Voltage	I_E=10μA, I_C=0	$V_{(BR)EBO}$	6.0	-	V
Base Cut-Off Current	V_{CE}=30V, V_{EB}=3.0V	I_{BL}	-	50	nA
Collector Cut-Off Current	V_{CE}=30V, V_{EB}=3.0V	I_{CEX}	-	50	nA
DC Current Gain	V_{CE} =1.0V, I_C=0.1mA	h_{FE}	40	-	-
	V_{CE} =1.0V, I_C=1.0mA		70	-	
	V_{CE} =1.0V, I_C=10mA		100	300	
	V_{CE} =1.0V, I_C=50mA		60	-	
	V_{CE}=1.0V, I_C=100mA		30	-	
Collector-Emitter Saturation Voltage	I_C=10mA, I_B=1.0mA	V_{CE}(sat)	-	0.2	V
	I_C=50mA, I_B=5.0mA			0.3	
Base-Emitter Saturation Voltage	I_C=10mA, I_B=1.0mA	V_{BE}(sat)	0.65	0.85	V
	I_C=50mA, I_B=5.0mA		-	0.95	
Current–Gain — Bandwidth Product	V_{CE} =20V, I_C=10mA, f=100 MHz	f_T	300	-	MHz
Output Capacitance	V_{CB} =5.0V, I_E=0, f=1.0 MHz	C_{obo}	-	4.0	pF
Input Capacitance	V_{BE}=0.5V, I_C=0, f=1.0 MHz	C_{ibo}	-	8.0	pF
Input Impedance	V_{CE} =10V, I_C=1.0mA, f=1.0 kHz	h_{ie}	1.0	10	kΩ
Voltage Feedback Ratio	V_{CE} =10V, I_C=1.0mA, f=1.0 kHz	h_{re}	0.5	8.0	$\times 10^{-4}$
Small–Signal Current Gain	V_{CE} =10V, I_C=1.0mA, f=1.0 kHz	h_{fe}	100	400	-
Output Admittance	V_{CE} =10V, I_C=1.0mA, f=1.0 kHz	h_{oe}	1.0	40	μmhos
Noise Figure	V_{CE} =5.0V, I_C=100μA, R_S=1.0kΩ, f=1.0 kHz	N_F	-	5.0	dB
Delay Time	V_{CC} =3.0V, V_{BE}=0.5V	t_d	-	35	nS
Rise Time	I_C =10mA , I_{B1}=1.0mA	t_r	-	35	nS
Storage Time	V_{CC} =3.0V, I_C=10mA	t_s	-	200	nS
Fall Time	I_{B1}=I_{B2}=1.0mA	t_f	-	50	nS

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

CHARACTERISTIC CURVES

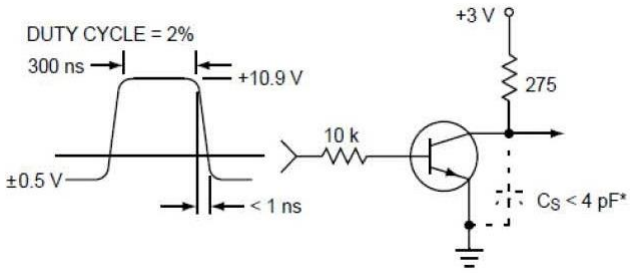


Fig1: Delay and Rise Time Equivalent Test Circuit

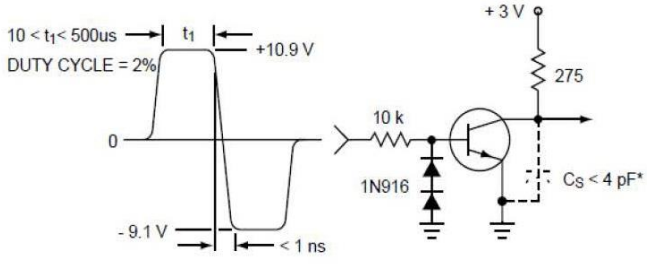


Fig2: Storage and Fall Time Equivalent Test Circuit

CHARACTERISTIC CURVES

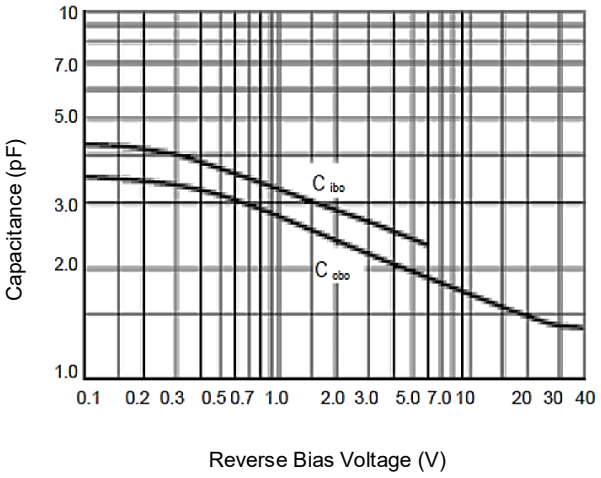


Fig3: Capacitance

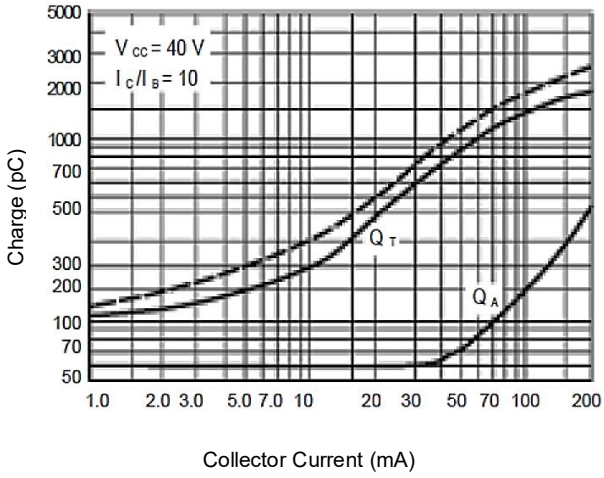


Fig4: Charge Data

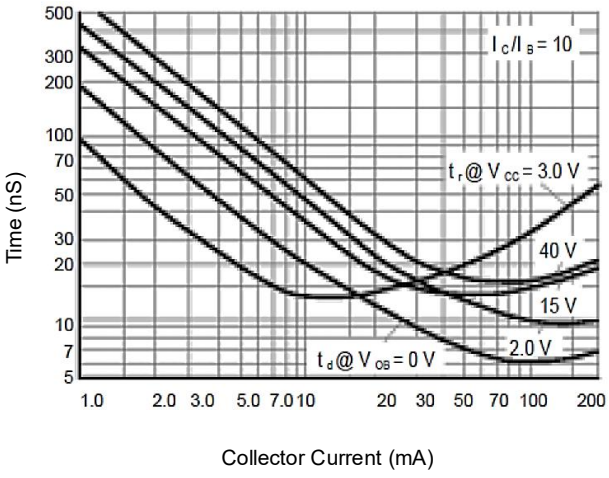


Fig5. Turn On Time

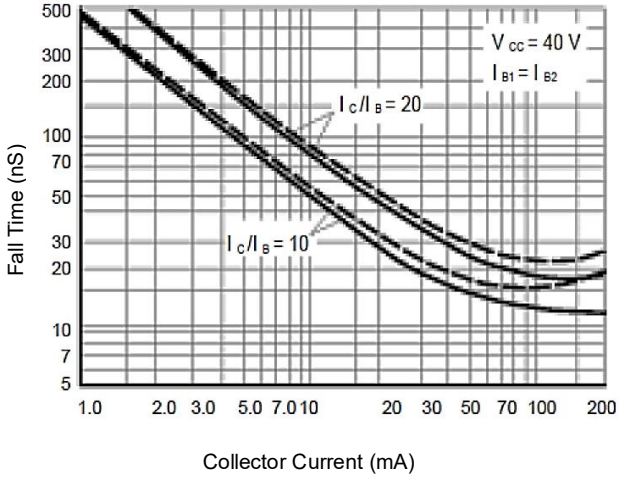


Fig6. Fall Time

CHARACTERISTIC CURVES

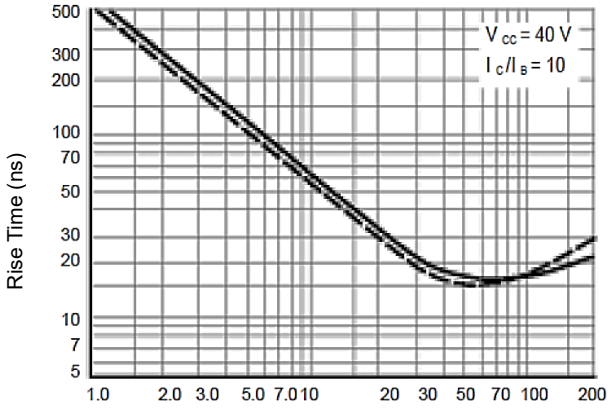


Fig7. Rise Time

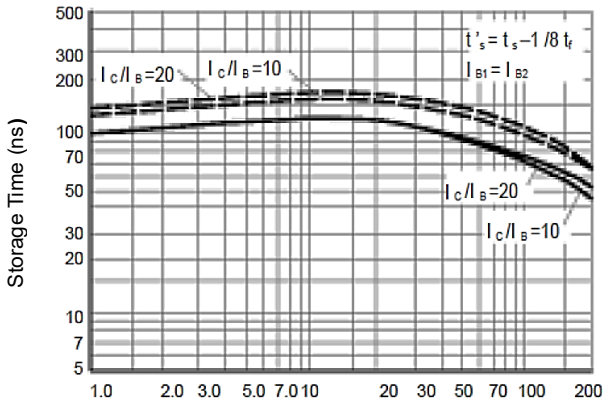


Fig8. Storage Time

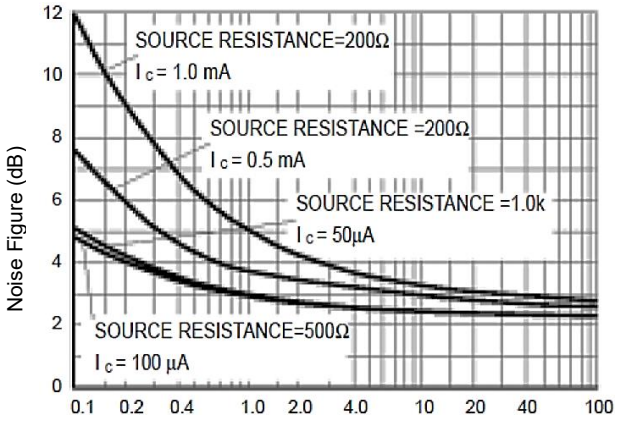


Fig9. Noise Figure vs Frequency

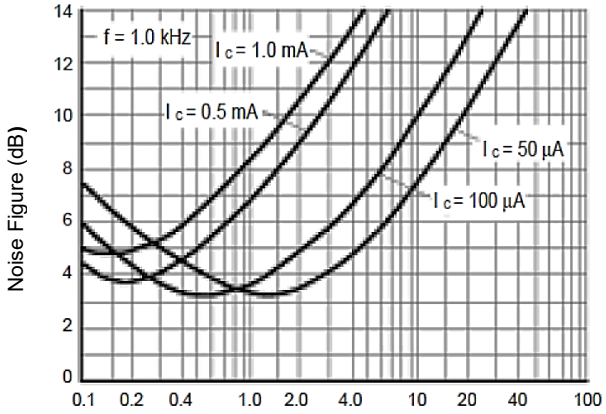


Fig10. Noise Figure vs Source Resistance

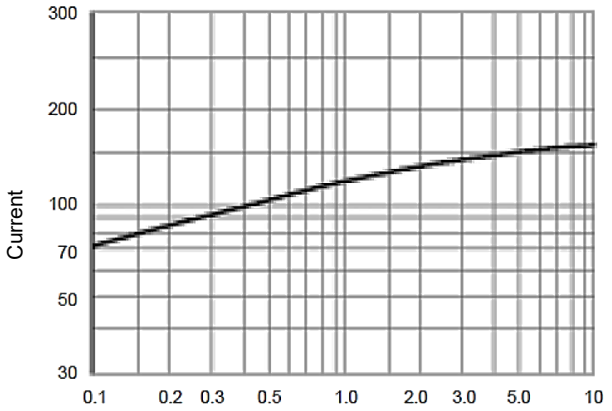


Fig11. Current Gain

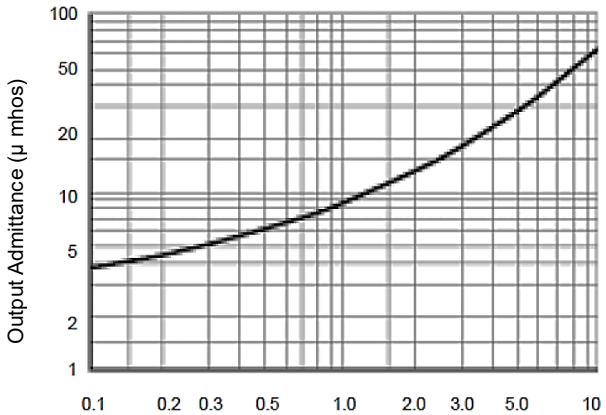


Fig12. Output Admittance

CHARACTERISTIC CURVES

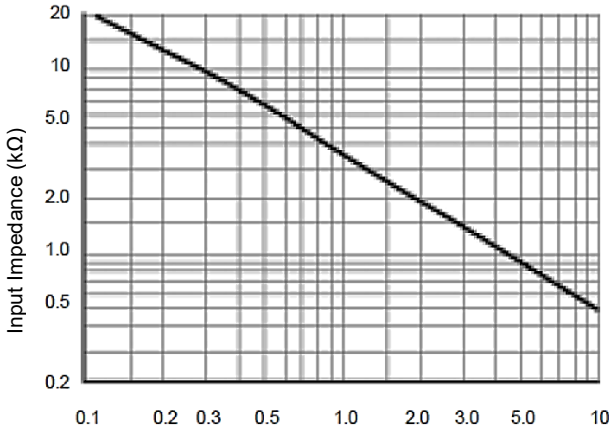


Fig13. Input Impedance

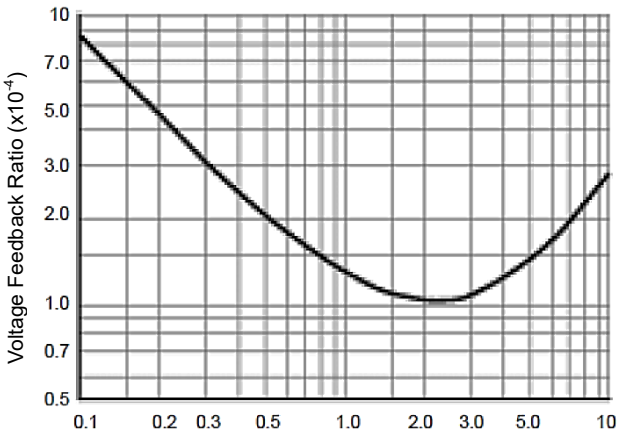


Fig14. Voltage Feedback Ratio

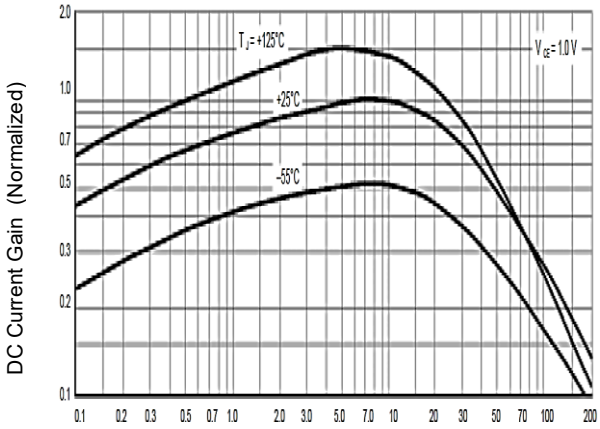


Fig15. DC Current Gain

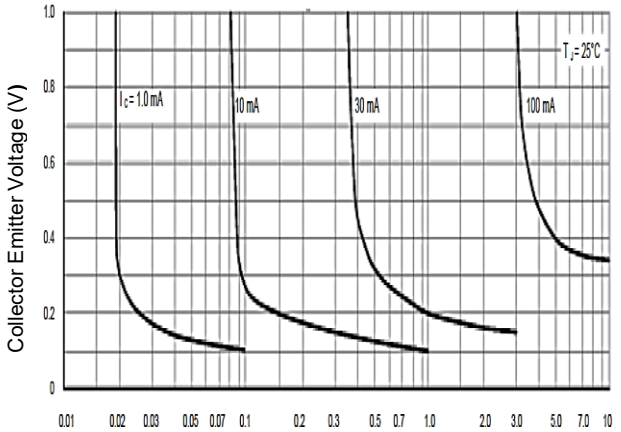


Fig16. Collector Saturation Region

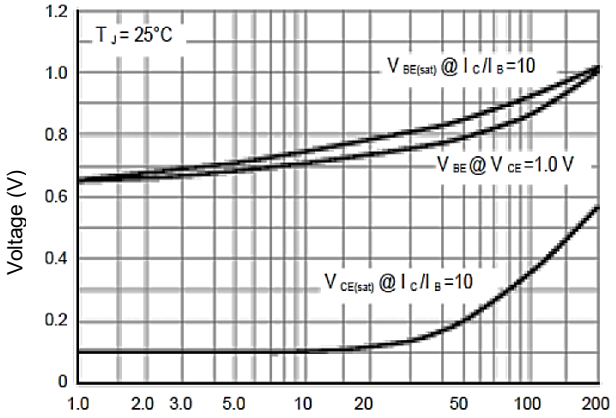


Fig15. "ON" Voltages

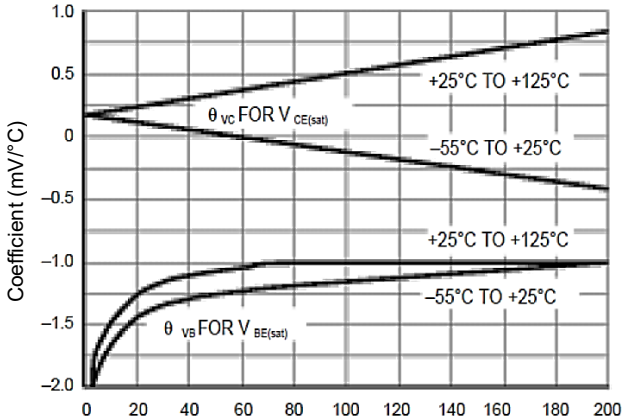


Fig16. Temperature Coefficients

*Specifications subject to change without notice.