GSTMMBT3904

NPN General Purpose Transistor

Product Description

This device is designed as a general purpose amplifier and switch.

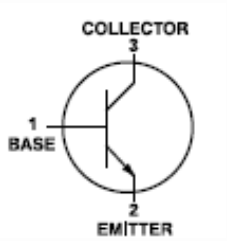
Features

- Lead(Pb)-Free

Packages & Pin Assignments

GSTMMBT3904F(SOT-23)

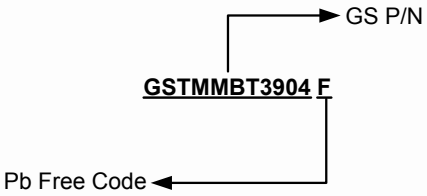
Pin	Description
1	Base
2	Emitter
3	Collector



Marking Information

P/N	Package	Part Marking
GSTMMBT3904F	SOT-23	1AM

Ordering Information



Part Number	Package	Quantity
GSTMMBT3904F	SOT-23	3000 PCS

Absolute Maximum Ratings

T_A=25°C

Symbol	Conditions	Typical	Unit
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	60	V
V_{EBO}	Emitter-Base Voltage	6.0	V
$I_{C(DC)}$	Collector Current (DC)	200	mA
P_D	Total Device Dissipation FR-5 Board (1)T_A=25°C	225	mW
	Derate above 25°C	1.8	mW/°C
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	556	°C/W
P_D	Total Device Dissipation Alumina Substrate (2)T_A=25°C	300	mW
	Derate above 25°C	2.4	mW/°C
$R_{\theta JA}$	Thermal Resistance Junction to Ambient	417	°C/W
T_J	Junction Temperature Range	-55 to +150	°C
T_{STG}	Storage Temperature Range	-55 to +150	°C

Note 1: FR-5=1.0 x 0.75 x 0.062 in

Note 2: Alumina=0.4 x 0.3 x 0.024 in. 99.5% alumina.

Electrical Characteristics

(T_A=25°C unless otherwise noted)

Symbol	Conditions	Min	Max	Unit
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage (I_C=1.0mA, I_B=0mA)	40	-	V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage (I_C=10uA, I_E=0mA)	60	-	V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage (I_E=10uA, I_C=0mA)	6.0	-	V
I_{CEX}	Collector Cutoff Current (V_{CE}=30V, $V_{EB(off)}$=3.0V)	-	50	nA
I_{BL}	Base Cutoff Current (V_{CE}=30V, $V_{EB(off)}$=3.0V)	-	50	nA
h_{FE}	DC Current Gain (I_C=0.1mA, V_{CE}=1.0V)	40	-	-
	DC Current Gain (I_C=1.0mA, V_{CE}=1.0V)	70	-	-
	DC Current Gain (I_C=10mA, V_{CE}=1.0V)	100	300	-
	DC Current Gain (I_C=50mA, V_{CE}=1.0V	60	-	-
	DC Current Gain (I_C=100mA, V_{CE}=1.0V)	30	-	-

Electrical Characteristics (Continue)

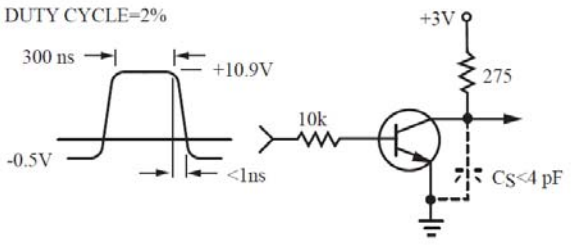
(T_A=25°C unless otherwise noted)

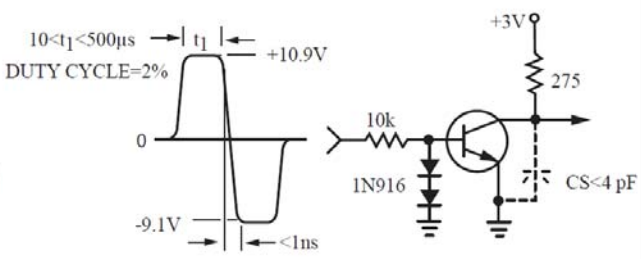
Symbol	Conditions	Min	Max	Unit
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage (3) (I_C=10mA, I_B=1.0mA) (I_C=50mA, I_B=5.0mA)	- -	0.2 0.3	V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage (3) (I_C=10mA, I_B=1.0mA) (I_C=50mA, I_B=5.0mA)	0.65 -	0.85 0.95	V
f_T	Current-Gain-Bandwidth Product (4) (I_C=10mA, V_{CE}=20V, f=100MHz)	300	-	MHz
C_{obo}	Output Capacitance (V_{CB}=5V, I_E=0mA, f=1.0MHz)	-	4.0	pF
C_{ibo}	Input Capacitance (V_{EB}=0.5V, I_C=0mA, f=1.0MHz)	-	8.0	pF
h_{ie}	Input Impedance (I_C=1.0mA, V_{CE}=10V, f=1.0 kHz)	1.0	10	KΩ
h_{re}	Voltage Feedback Radio (I_C=1.0mA, V_{CE}=10V, f=1.0 kHz)	0.5	8.0	$x10^{-4}$
h_{fe}	Small-Signal Current Gain (I_C=1.0mA, V_{CE}=10V, f=1.0 kHz)	100	400	-
h_{oe}	Output Admittance (I_C=1.0mA, V_{CE}=10V, f=1.0kHz)	1.0	40	umhos
NF	Noise Figure (I_C=100μA, V_{CE}=5V, R_S=1.0kΩ, f=1.0kHz)	-	5.0	dB
t_d	Delay Time (V_{CC}=3.0V, $V_{BE(off)}$=-0.5V, I_C=10mA, I_{B1}=1.0mA)	-	35	ns
t_r	Rise Time (V_{CC}=3.0V, $V_{BE(off)}$=-0.5V, I_C=10mA, I_{B1}=1.0mA)	-	35	ns
t_s	Storage Time (V_{CC}=3.0V, I_C=10mA, I_{B1}=I_{B2}=1.0mA)	-	200	ns
t_f	Fall Time (V_{CC}=3.0V, I_C=10mA, I_{B1}=I_{B2}=1.0mA)	-	50	ns

Note 3: Pulse Test: Pulse Width ≤ 300 us, Duty Cycle ≤ 2.0%

Note 4: f_T is defined as the frequency at which h_{fe} extrapolates to unity

Typical Application Circuit





*Total shunt capacitance of test jig and connectors

FIG.1 Delay and Rise Time Equivalent Test Circuit

FIG.2 Storage and Fall Time Equivalent Test Circuit

Typical Performance Characteristics

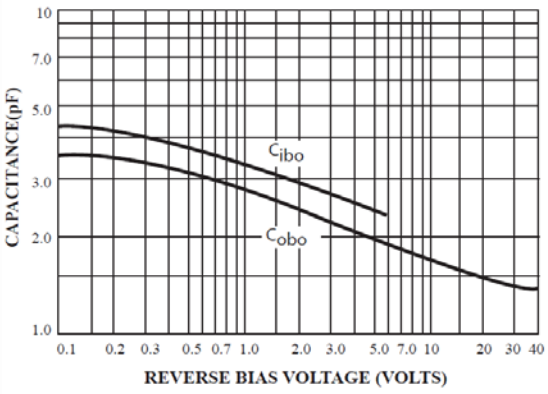


FIG.3 Capacitance

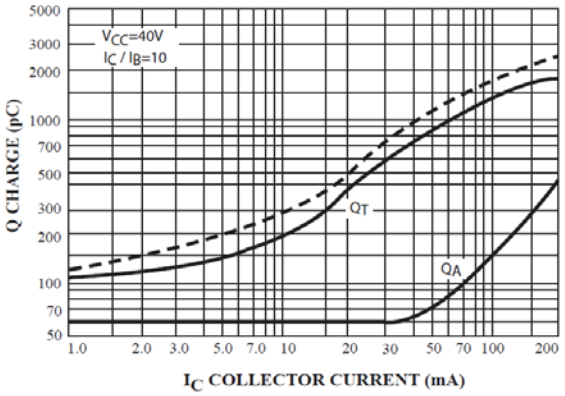


FIG.4 Charge Data

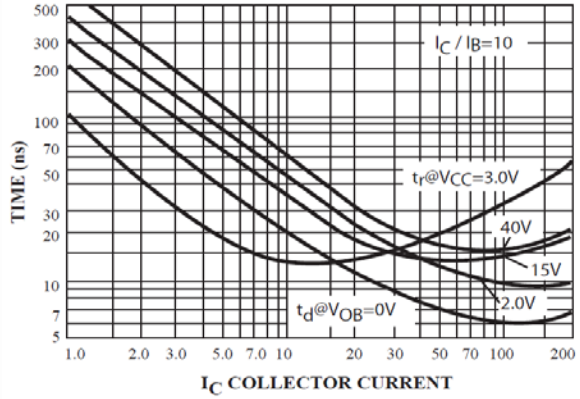


FIG.5 Turn-On Time

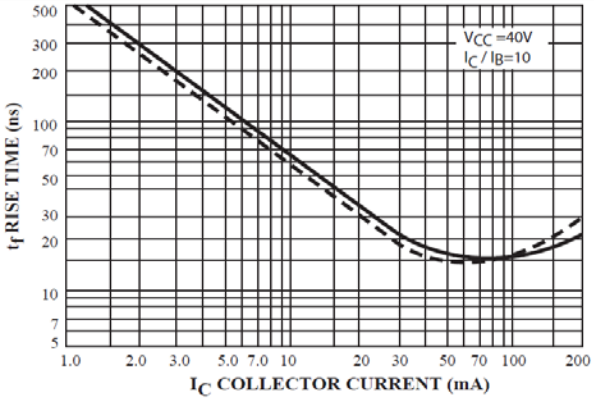


FIG.6 Rise Time

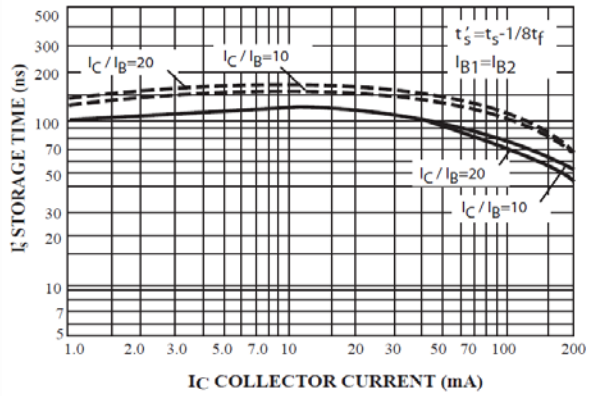


FIG.7 Storage Time

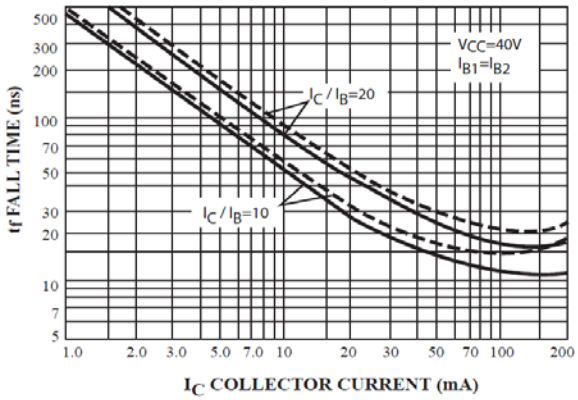


FIG.8 Fall Time

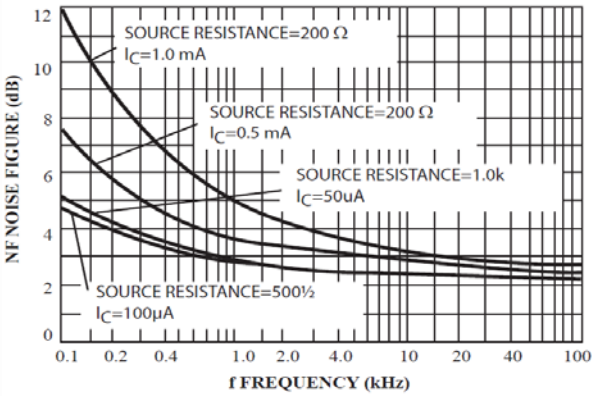


FIG.9

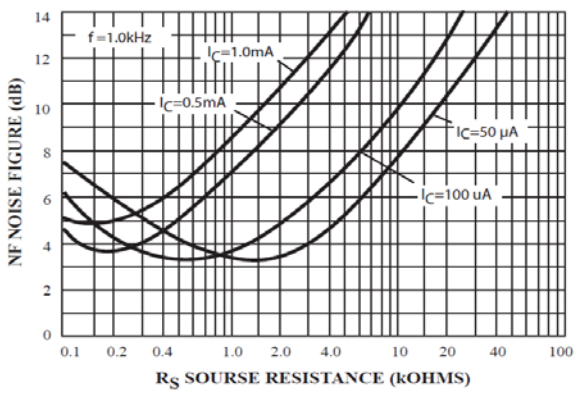


FIG.10

Typical Performance Characteristics (Continue)

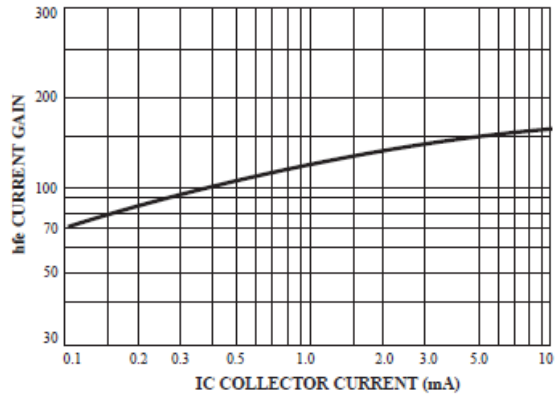


FIG.11 Current Gain

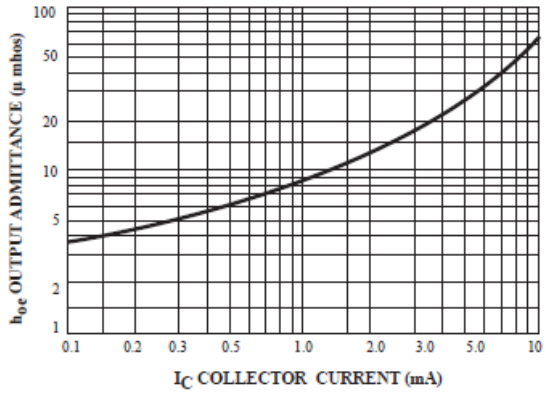


FIG.12 Output Admittance

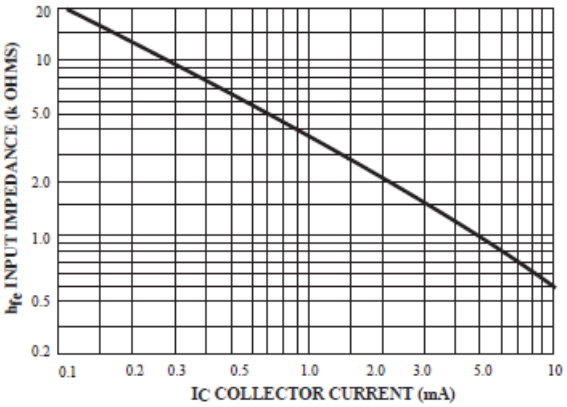


FIG.13 Input Impedance

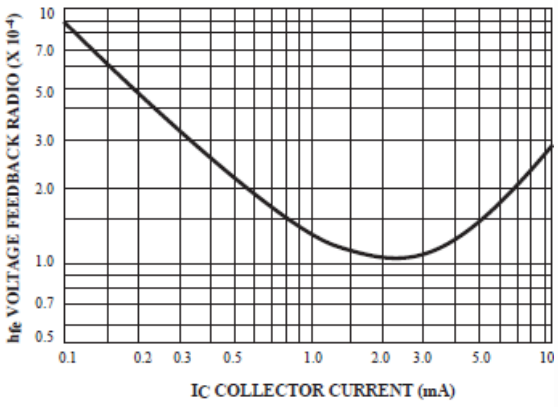


FIG.14 Voltage Feedback Radio

TYPICAL STATIC CHARACTERISTICS

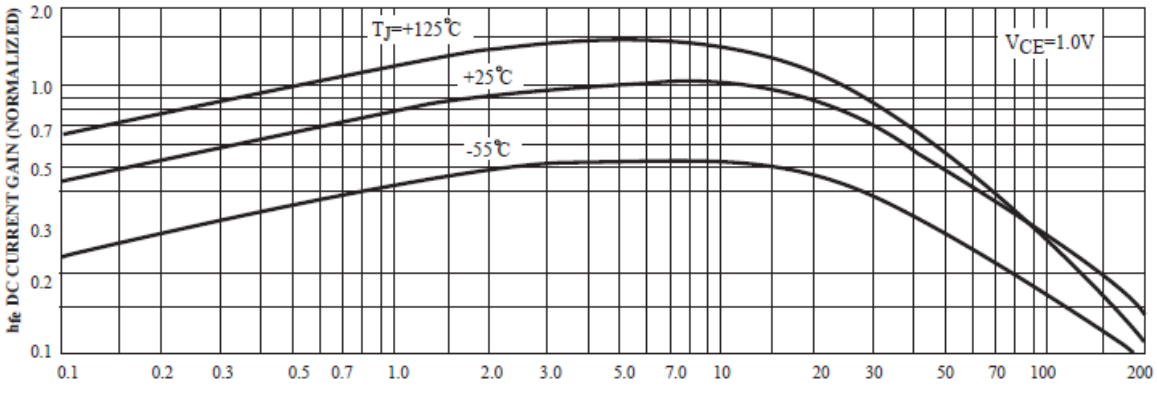


FIG.15 DC Current Gain

Typical Performance Characteristics (Continue)

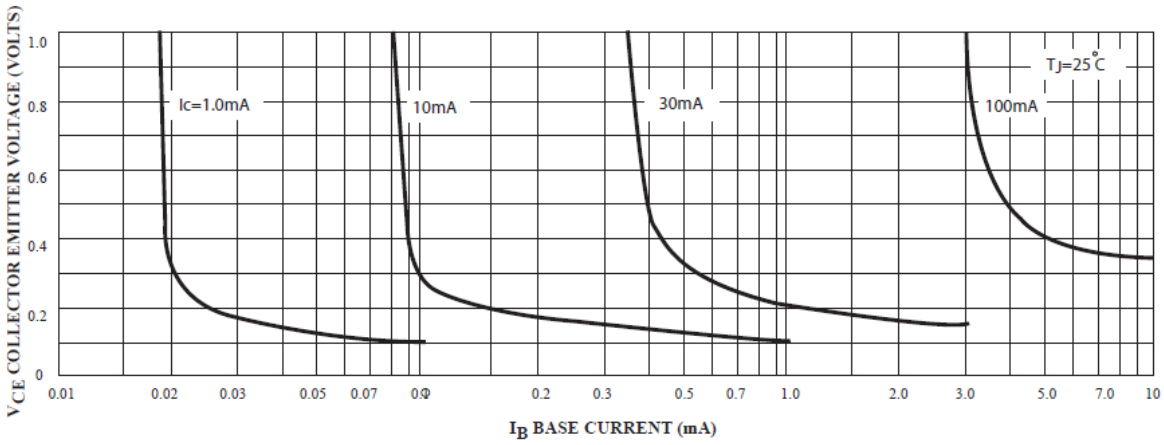


FIG.16 Collector Saturation Ragion

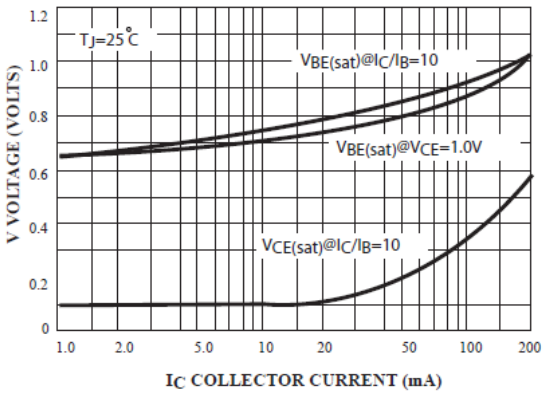


FIG.17 "ON" Voltage

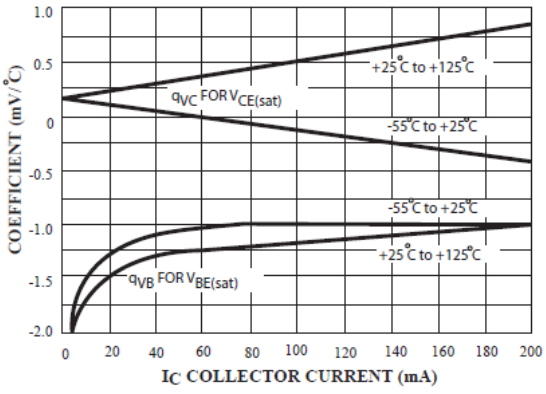
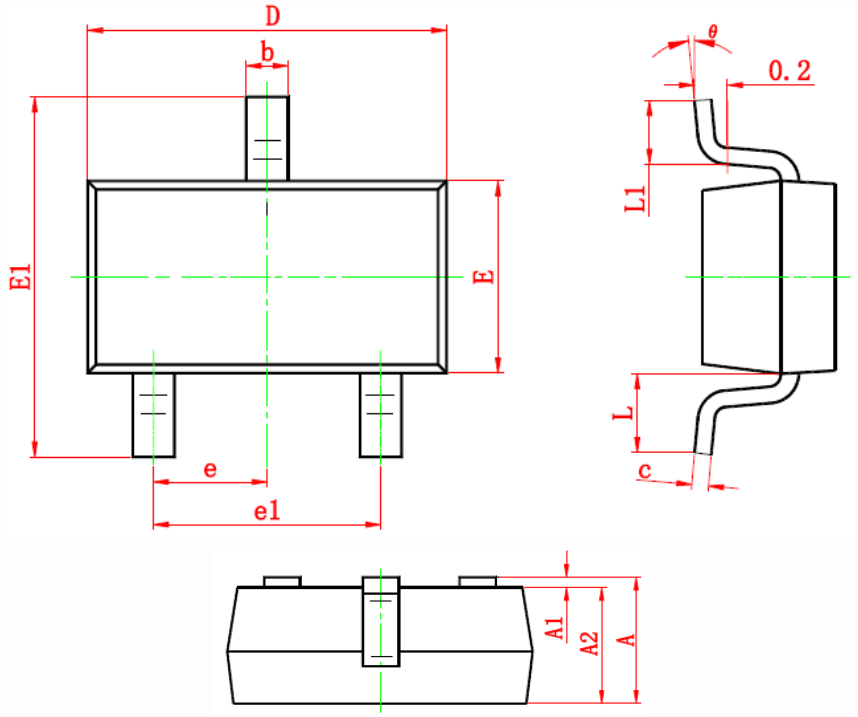


FIG.18 Temperature Coefficients

Package Dimension

SOT-23



Dimensions				
Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	0.900	1.200	0.035	0.043
A1	0.000	0.100	0.000	0.004
A2	0.900	1.100	0.035	0.039
b	0.350	0.510	0.014	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.100	3.000	0.083	0.118
e	0.950 TYP		0.037 TYP	
e1	1.800	2.000	0.071	0.079
L	0.550 REF		0.022 REF	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	6°

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