

GSTMMBT3904

NPN General Purpose Transistor

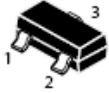
Product Description

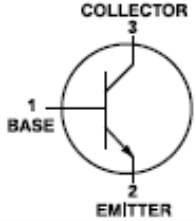
This device is designed as a general purpose amplifier and switch.

Features

- Lead(Pb)-Free

Packages & Pin Assignments

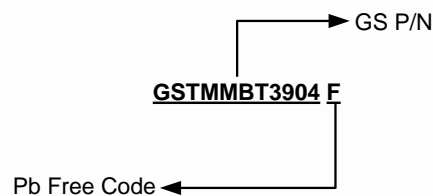
GSTMMBT3904F(SOT-23)	
	
Pin	Description
1	Base
2	Emitter
3	Collector



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
	Total Device Dissipation Alumina Substrate (2)T _A =25°C	300	mW
	Derate above 25°C	2.4	mW/°C
R _{θJA}	Thermal Resistance Junction to Ambient	556	°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 Ratio (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

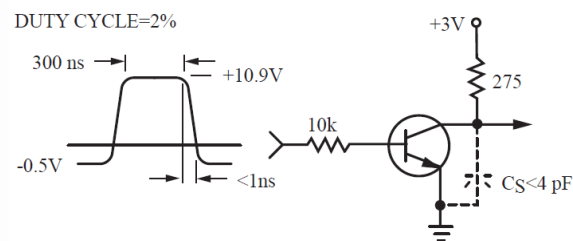


FIG.1 Delay and Rise Time
Equivalent Test Circuit

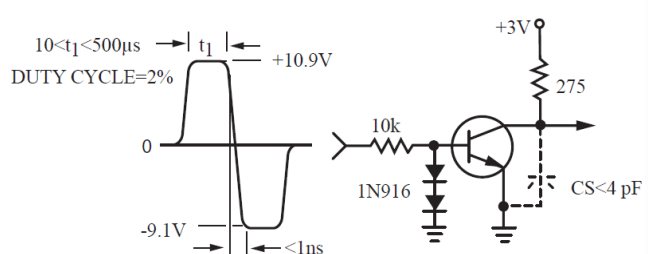
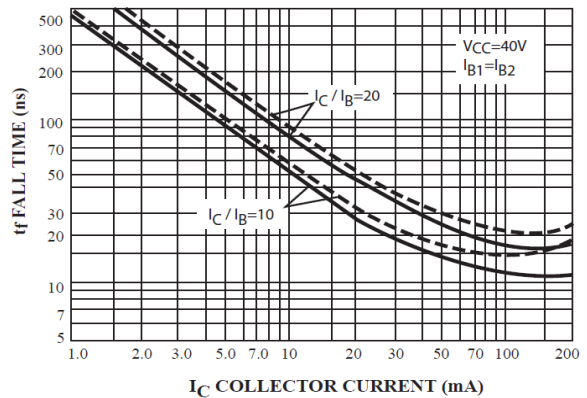
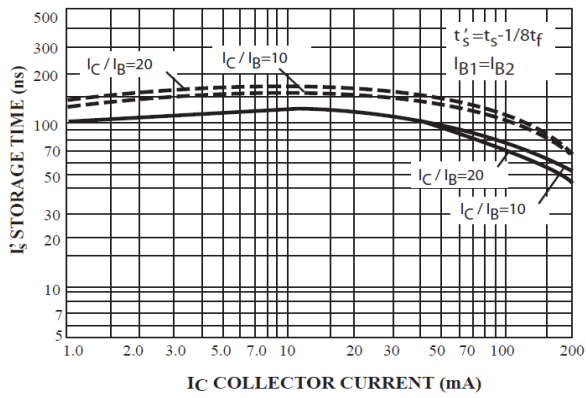
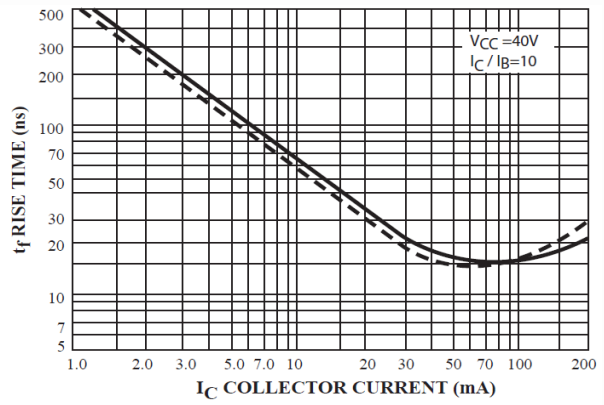
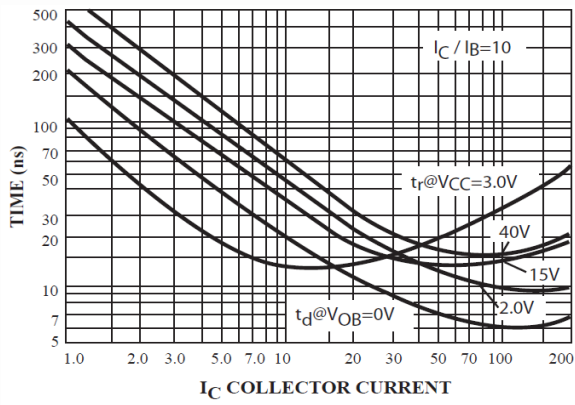
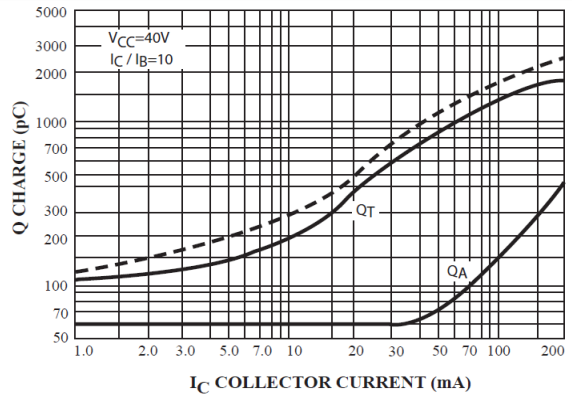
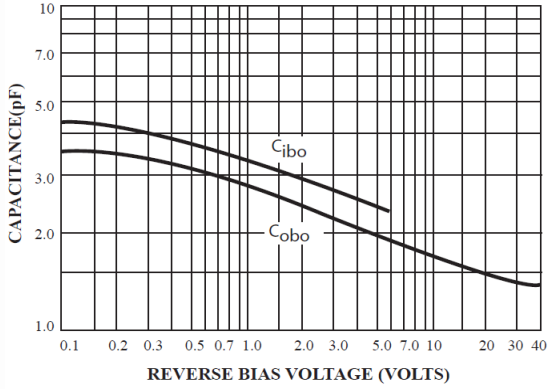


FIG.2 Storage and Fall Time
Equivalent Test Circuit

*Total shunt capacitance of test jig and connectors

Typical Performance Characteristics



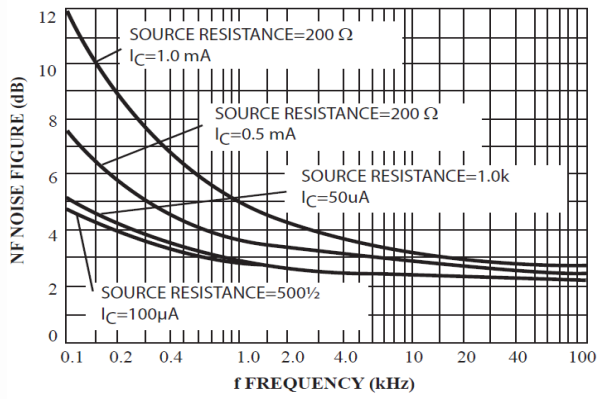


FIG.9

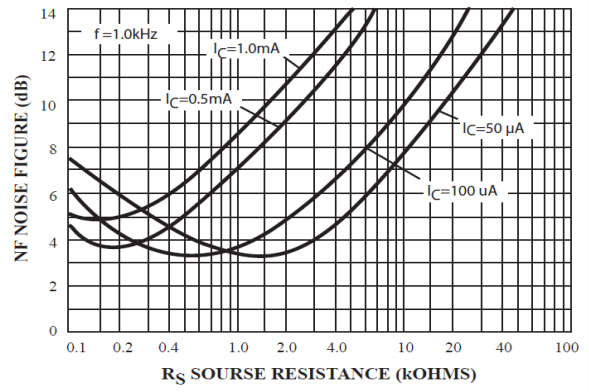


FIG.10

Typical Performance Characteristics (Continue)

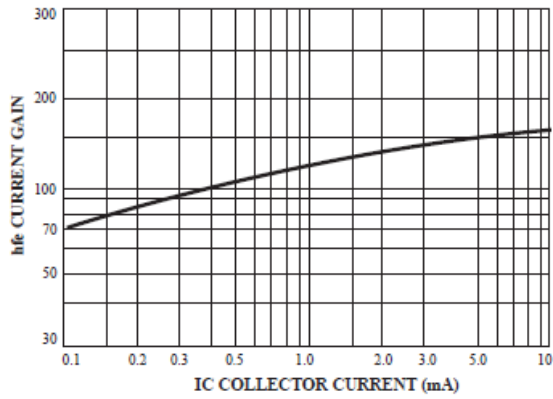


FIG.11 Current Gain

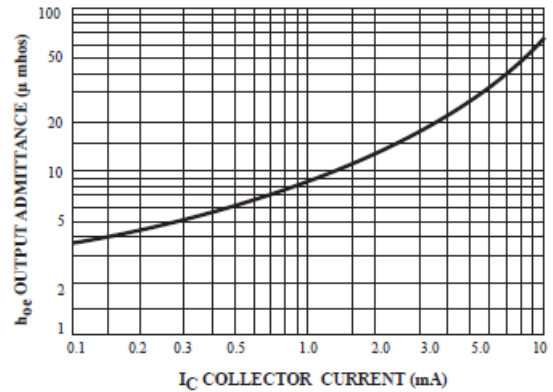


FIG.12 Output Admittance

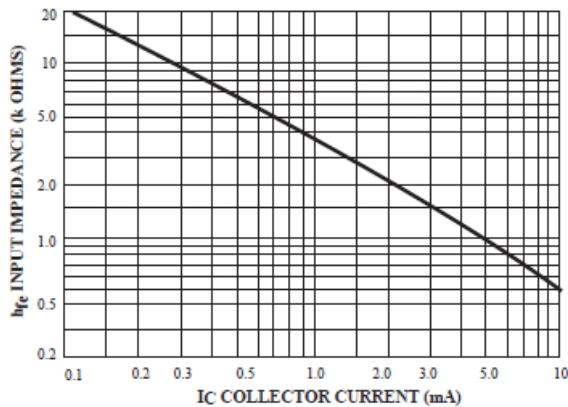


FIG.13 Input Impedance

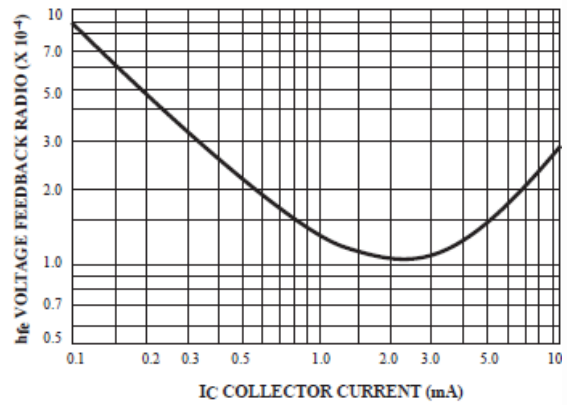


FIG.14 Voltage Feedback Ratio

TYPICAL STATIC CHARACTERISTICS

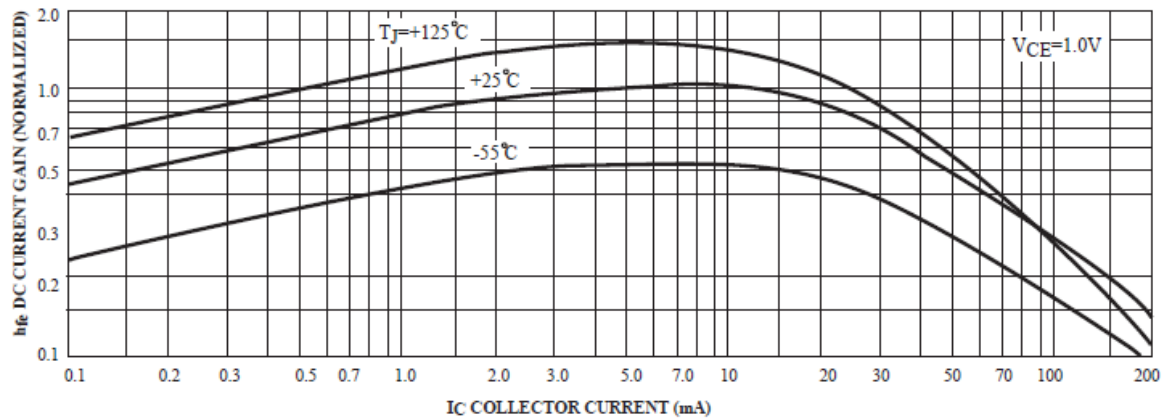


FIG.15 DC Current Gain

Typical Performance Characteristics (Continue)

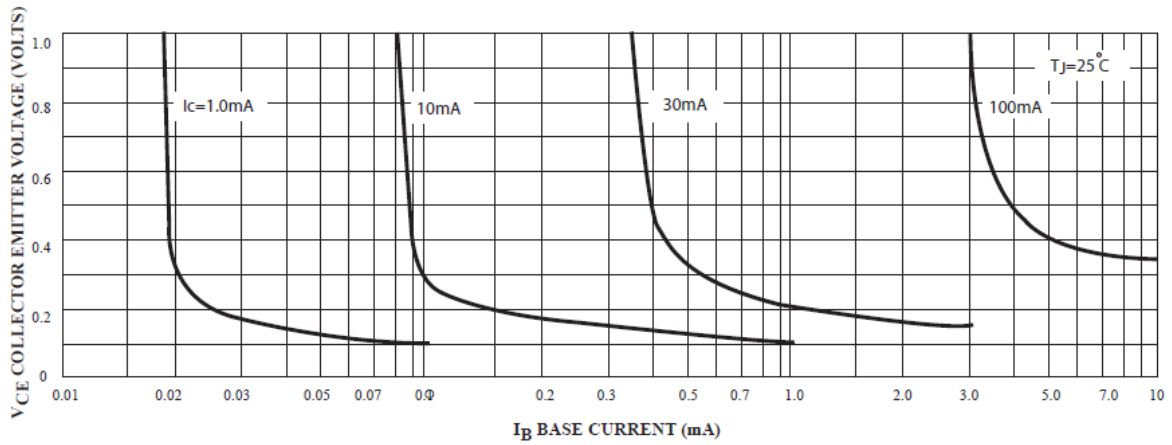


FIG.16 Collector Saturation Region

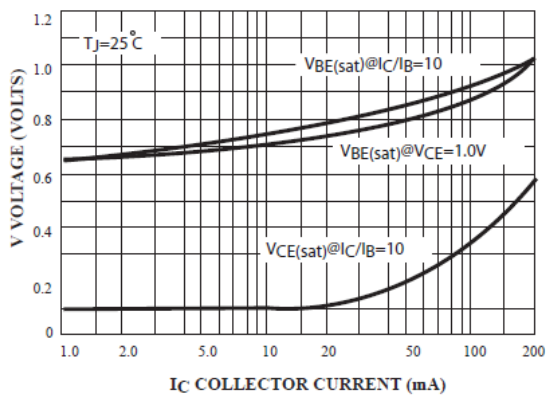


FIG.17 "ON" Voltage

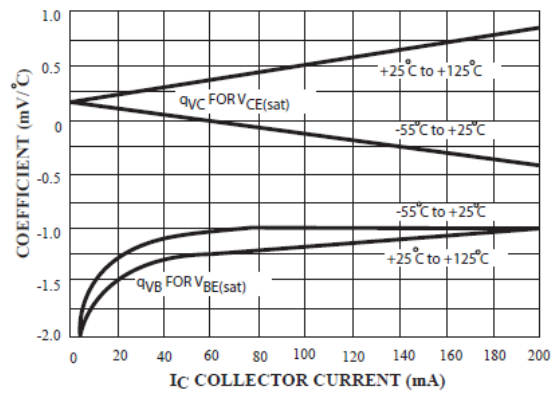
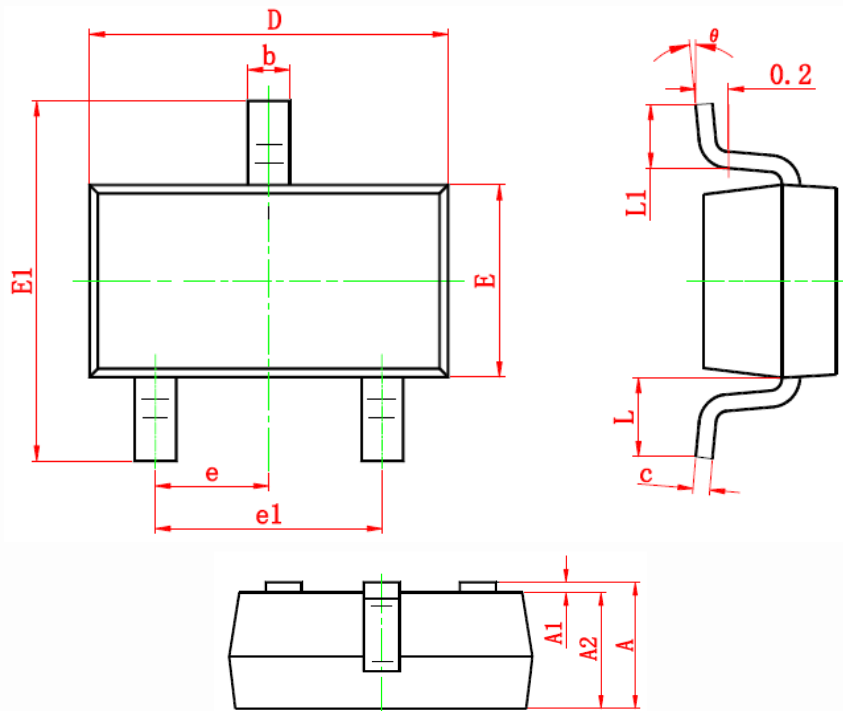


FIG.18 Temperature Coefficients

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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CONTACT US

GS Headquarter	
	4F.,No.43-1,Lane11,Sec.6,Minquan E.Rd Neihu District Taipei City 114, Taiwan (R.O.C)
	886-2-2657-9980
	886-2-2657-3630
	sales_twn@gs-power.com

	824 Bolton Drive Milpitas. CA. 95035
	1-408-457-0587