General Purpose Transistors

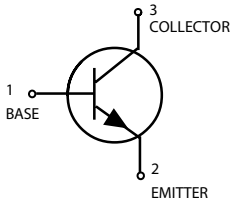
NPN Silicon

LMBT3904WT1G
S-LMBT3904WT1G

These transistors are designed for general purpose amplifier applications. They are housed in the SOT–323/SC–70 which is designed for low power surface mount applications.

- We declare that the material of product compliance with RoHS requirements.
- S- Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

CASE 419–02, STYLE 3
SOT– 323 / SC–70



DEVICE MARKING AND ORDERING INFORMATION

Device	Marking	Package	Shipping
LMBT3904WT1G S-LMBT3904WT1G	AM	SOT-323/SC-70	3000/Tape&Reel
LMBT3904WT3G S-LMBT3904WT3G	AM	SOT-323/SC-70	10000/Tape&Reel

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage	V_{CEO}	40	Vdc
Collector–Base Voltage	V_{CBO}	60	Vdc
Emitter–Base Voltage	V_{EBO}	6.0	Vdc
Collector Current — Continuous	I_C	200	mAdc

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation (1) T_A=25 °C Derate above 25 °C	P_D	150 1.2	mW mW/°C
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	833	°C/W
Junction and Storage Temperature	T_J, T_{stg}	–55 to +150	°C

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

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector–Emitter Breakdown Voltage (2) (I_C = 1.0 mAdc, I_B = 0)	$V_{(BR)CEO}$	40	—	Vdc
Collector–Base Breakdown Voltage (I_C = 10 µAdc, I_E = 0)	$V_{(BR)CBO}$	60	—	Vdc
Emitter–Base Breakdown Voltage (I_E= 10 µAdc, I_C = 0)	$V_{(BR)EBO}$	6.0	—	Vdc
Base Cutoff Current (V_{CE} = 30 Vdc, V_{EB} = 3.0 Vdc)	I_{BL}	—	50	nAdc
Collector Cutoff Current (V_{CE} = 30 Vdc, V_{EB} = 3.0 Vdc)	I_{CEX}	—	50	nAdc

1. Device mounted on FR4 glass epoxy printed circuit board using the minimum recommended footprint.
2. Pulse Test: Pulse Width ≤300 µs; Duty Cycle ≤2.0%.

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted) (Continued)

Characteristic	Symbol	Min	Max	Unit
ON CHARACTERISTICS (2)				
DC Current Gain	h_{FE}			—
(I_C = 0.1 mAdc, V_{CE} = 1.0 Vdc)		40	—	
(I_C = 1.0 mAdc, V_{CE} = 1.0 Vdc)		70	—	
(I_C = 10 mAdc, V_{CE} = 1.0 Vdc)		100	300	
(I_C = 50 mAdc, V_{CE} = 1.0 Vdc)		60	—	
(I_C = 100 mAdc, V_{CE} = 1.0 Vdc)		30	—	
Collector–Emitter Saturation Voltage	$V_{CE(sat)}$			Vdc
(I_C = 10 mAdc, I_B = 1.0 mAdc)		—	0.2	
(I_C = 50 mAdc, I_B = 5.0 mAdc)		—	0.3	
Base–Emitter Saturation Voltage	$V_{BE(sat)}$			Vdc
(I_C = 10 mAdc, I_B = 1.0 mAdc)		0.65	0.85	
(I_C = 50 mAdc, I_B = 5.0 mAdc)		—	0.95	

SMALL–SIGNAL CHARACTERISTICS

Current–Gain — Bandwidth Product	f_T			MHz
(I_C = 10 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)		300	—	
Output Capacitance	C_{obo}			pF
(V_{CB} = 5.0 Vdc, I_E = 0, f = 1.0 MHz)		—	4.0	
Input Capacitance	C_{ibo}			pF
(V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz)		—	8.0	
Input Impedance	h_{ie}			kΩ
(V_{CE}= 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)		1.0	10	
Voltage Feedback Ratio	h_{re}			X 10^{-4}
(V_{CE}= 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)		0.5	8.0	
Small–Signal Current Gain	h_{fe}			—
(V_{CE}= 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)		100	400	
Output Admittance	h_{oe}			µmhos
(V_{CE}= 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)		1.0	40	
Noise Figure	NF			dB
(V_{CE}= 5.0Vdc, I_C = 100µAdc, R_S=1.0 kΩ, f =1.0kHz)		—	5.0	

SWITCHING CHARACTERISTICS

Delay Time (V_{CC} = 3.0 Vdc, V_{BE} = –0.5 Vdc)	t_d	—	3 5	ns
Rise Time (I_C = 10 mAdc, I_{B1} = 1.0 mAdc)	t_r	—	3 5	ns
Storage Time (V_{CC} = 3.0 Vdc, I_C = 10 mAdc)	t_s	—	200	ns
Fall Time (I_{B1} = I_{B2} = 1.0 mAdc)	t_f	—	5 0	ns

2. Pulse Test: Pulse Width ≤300 µs; Duty Cycle ≤2.0%.

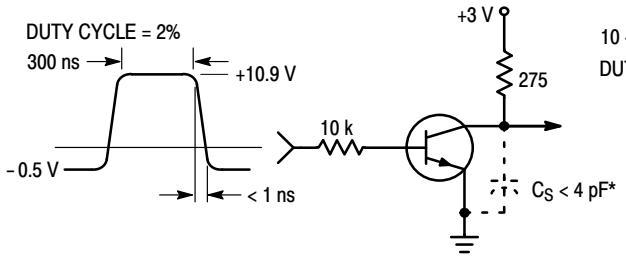
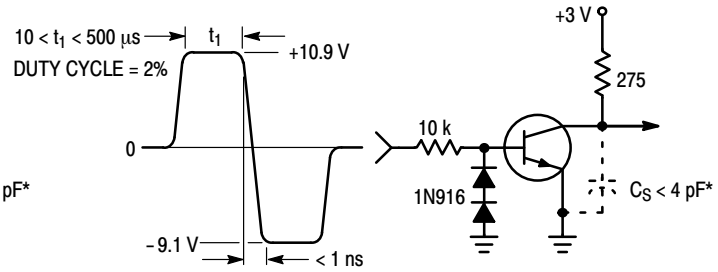


Figure 1. Delay and Rise Time
Equivalent Test Circuit



* Total shunt capacitance of test jig and connectors

Figure 2. Storage and Fall Time
Equivalent Test Circuit

ELECTRICAL CHARACTERISTIC CURVES
(Ta = 25°C)

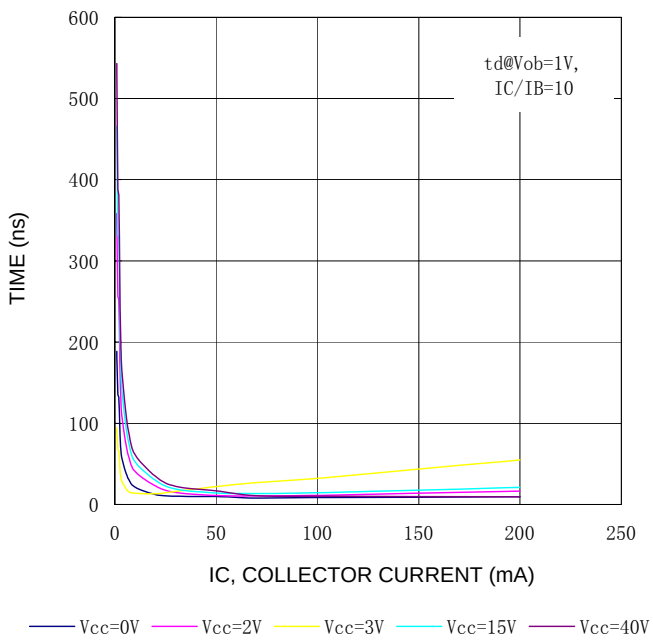


Fig.3 TURN-ON TIME

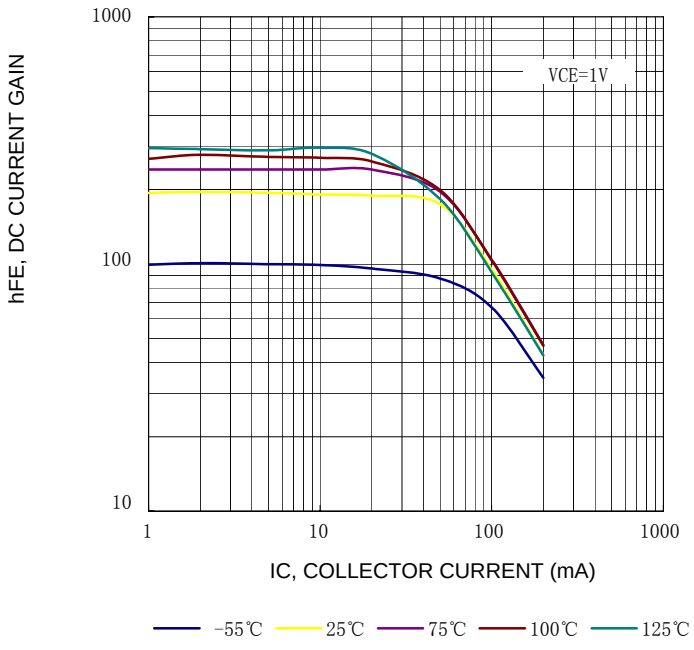


Fig.4 DC CURRENT GAIN

ELECTRICAL CHARACTERISTIC CURVES
(Ta = 25°C)

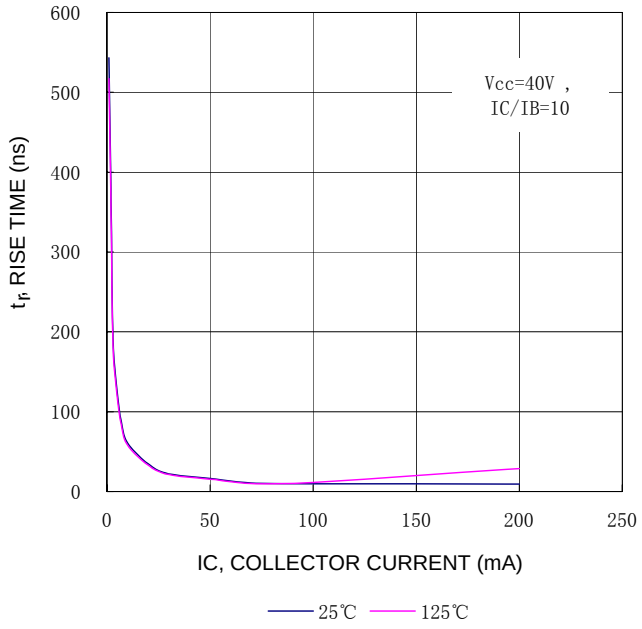


Fig.5 RISE TIME

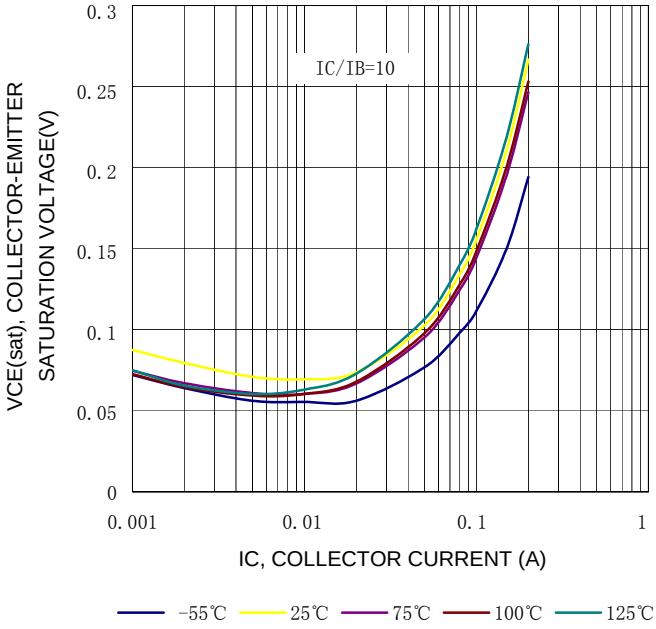


Fig.6 COLLECTOR EMITTER SATURATION VOLTAGE VS. COLLECTOR CURRENT

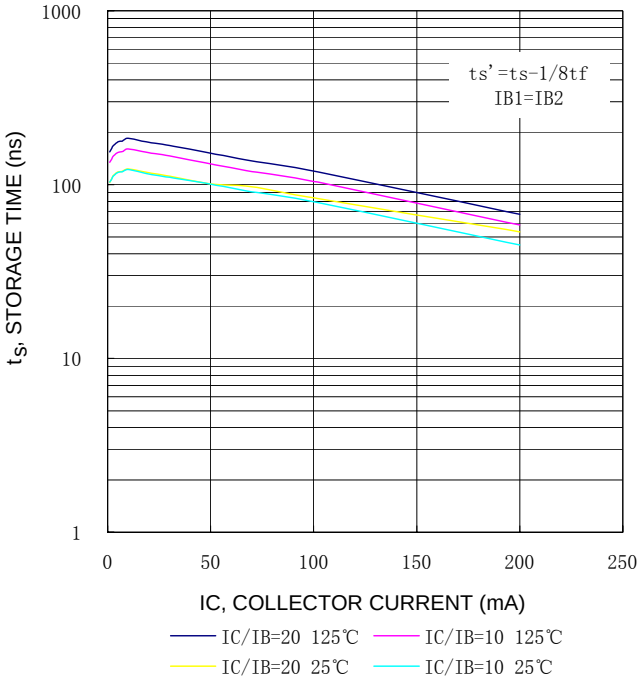


Fig.7 STORAGE TIME

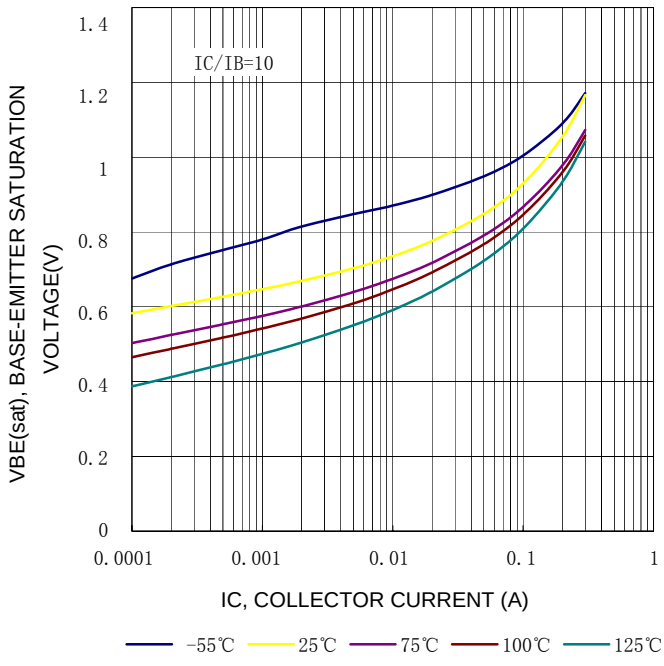


Fig.8 BASE EMITTER SATURATION VOLTAGE VS. COLLECTOR CURRENT

LMBT3904WT1G,S-LMBT3904WT1G

ELECTRICAL CHARACTERISTIC CURVES
(Ta = 25°C)

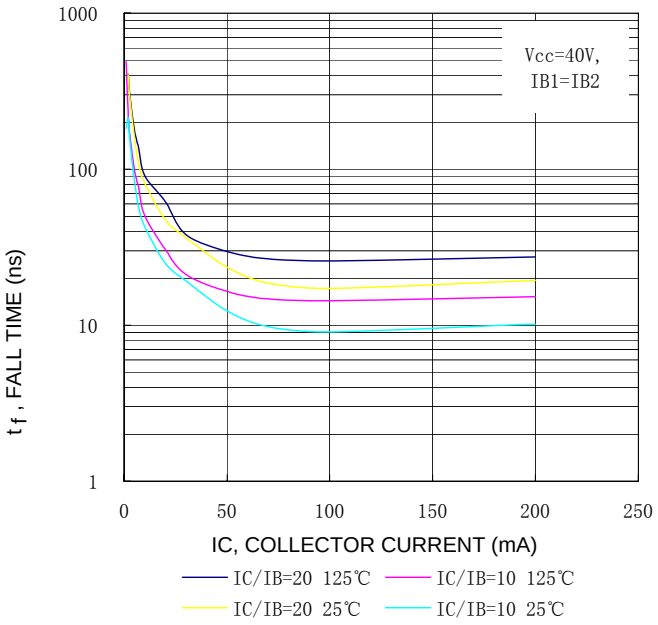


Fig.9 FALL TIME

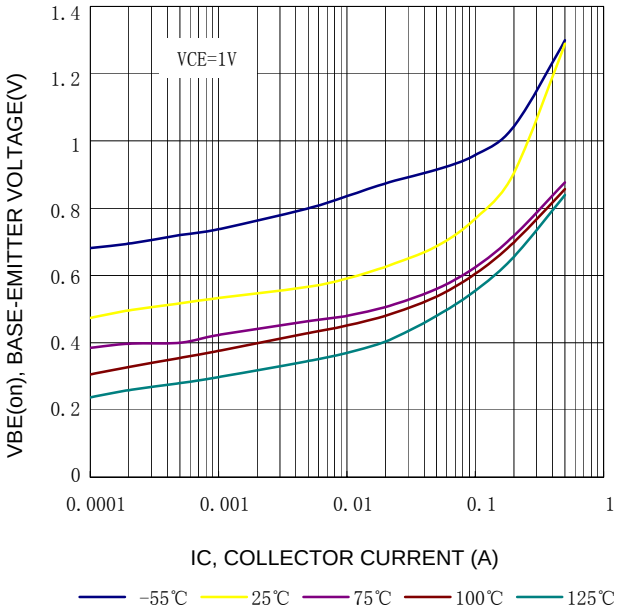


Fig.10 BASE EMITTER VOLTAGE VS. COLLECTOR CURRENT

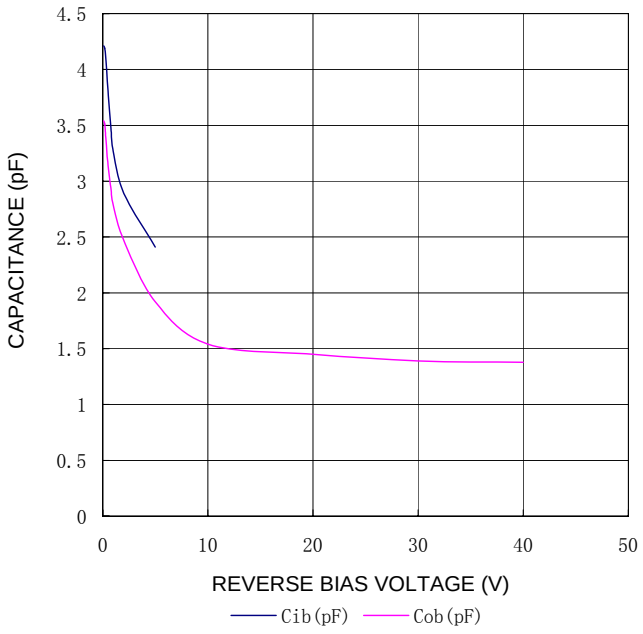


Fig.11 CAPACITANCE

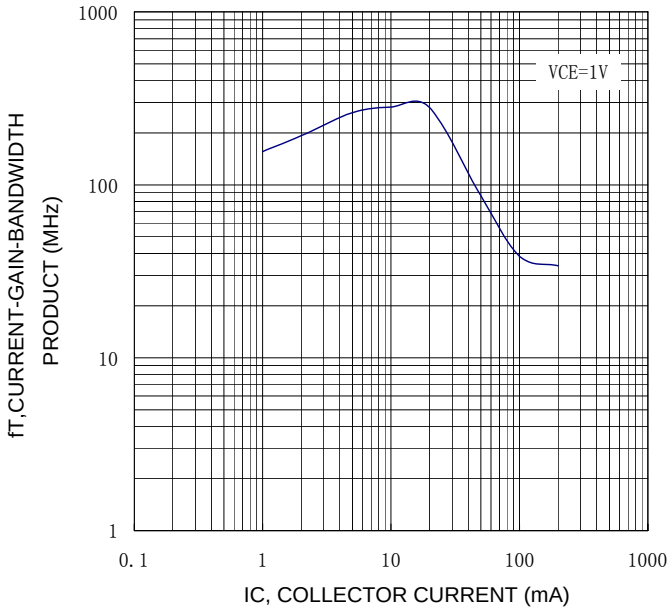
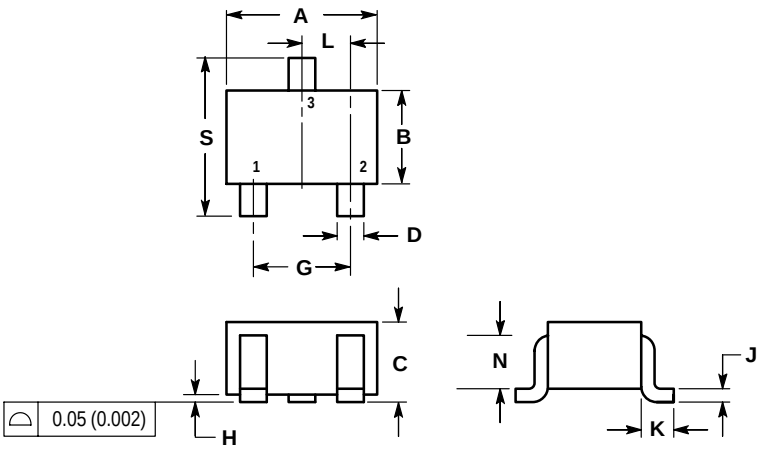


Fig.12 CURRENT GAIN BANDWIDTH PRODUCT VS.COLLECTOR CURRENT

SC–70 / SOT–323

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.



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	0.032	0.040	0.80	1.00
D	0.012	0.016	0.30	0.40
G	0.047	0.055	1.20	1.40
H	0.000	0.004	0.00	0.10
J	0.004	0.010	0.10	0.25
K	0.017 REF		0.425 REF	
L	0.026 BSC		0.650 BSC	
N	0.028 REF		0.700 REF	
S	0.079	0.095	2.00	2.40