

General Purpose Transistors NPN Silicon

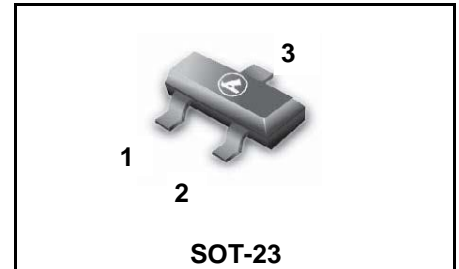
●FEATURES

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

●DEVICE MARKING AND RESISTOR VALUES

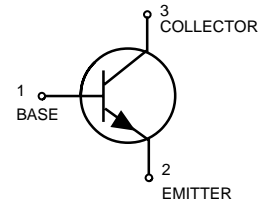
Device	Marking	Shipping
LMBT3904LT1G	1AM	3000/Tape&Reel
LMBT3904LT3G	1AM	10000/Tape&Reel

LMBT3904LT1G S-LMBT3904LT1G



●MAXIMUM RATINGS(Ta = 25°C)

Parameter	Symbol	Limits	Unit
Collector–Emitter Voltage	V _{CEO}	40	Vdc
Collector–Base Voltage	V _{CBO}	60	Vdc
Emitter–Base Voltage	V _{EBO}	6	Vdc
Collector Current — Continuous	I _C	200	mAdc



●THERMAL CHARACTERISTICS

Total Device Dissipation, FR-5 Board (Note 1) @ T _A = 25°C Derate above 25°C	P _D	225	mW
		1.8	mW/°C
Thermal Resistance, Junction–to–Ambient(Note 1)	R _{θJA}	556	°C/W
Total Device Dissipation, Alumina Substrate (Note 2) @ T _A = 25°C Derate above 25°C	P _D	300	mW
		2.4	mW/°C
Thermal Resistance, Junction–to–Ambient(Note 2)	R _{θJA}	417	°C/W
Junction and Storage temperature	T _J ,T _{stg}	-55 ~ +150	°C

1. FR-5 = 1.0×0.75×0.062 in.

2. Alumina = 0.4×0.3×0.024 in. 99.5% alumina.

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● ELECTRICAL CHARACTERISTICS (Ta= 25°C)
OFF CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Collector–Emitter Breakdown Voltage (I _C = 1.0 mA _{dc} , I _B = 0)	V _{BR(CEO)}	40	–	–	V
Collector–Base Breakdown Voltage (I _C = 10 μA _{dc} , I _E = 0)	V _{BR(CBO)}	60	–	–	V
Emitter–Base Breakdown Voltage (I _E = 10 μA _{dc} , I _C = 0)	V _{BR(EBO)}	6	–	–	V
Collector Cutoff Current (V _{CE} = 30 Vdc, V _{EB} = 3.0Vdc)	I _{CEx}	–	–	50	nA
Base Cutoff Current (V _{CE} = 30 Vdc, V _{EB} = 3.0 Vdc)	I _{BL}	–	–	50	nA

ON CHARACTERISTICS (Note 3.)

DC Current Gain (I _C = 0.1 mA _{dc} , V _{CE} = 1.0 Vdc)	h _{FE}	40	–	–	
(I _C = 1.0 mA _{dc} , V _{CE} = 1.0 Vdc)		70	–	–	
(I _C = 10 mA _{dc} , V _{CE} = 1.0 Vdc)		100	–	300	
(I _C = 50 mA _{dc} , V _{CE} = 1.0 Vdc)		60	–	–	
(I _C = 100 mA _{dc} , V _{CE} = 1.0 Vdc)		30	–	–	
Collector–Emitter Saturation Voltage(3) (I _C = 10 mA _{dc} , I _B = 1.0 mA _{dc})	V _{CE(sat)}	–	–	0.2	V
(I _C = 50mA _{dc} , I _B = 5.0 mA _{dc})		–	–	0.3	
Base–Emitter Saturation Voltage (I _C = 10 mA _{dc} , I _B = 1.0 mA _{dc})	V _{BE(sat)}	0.65	–	0.85	V
(I _C = 50mA _{dc} , I _B = 5.0 mA _{dc})		–	–	0.95	

SMALL–SIGNAL CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Current–Gain — Bandwidth Product (I _C = 10mA _{dc} , V _{CE} = 20Vdc, f = 100MHz)	f _T	300	–	–	MHz
Output Capacitance (V _{CB} = 5.0 Vdc, I _E = 0, f = 1.0 MHz)	C _{obo}	–	–	4	pF
Input Capacitance (V _{EB} = 0.5 Vdc, I _C = 0, f = 1.0 MHz)	C _{ibo}	–	–	8	pF
Input Impedance (V _{CE} = 10 Vdc, I _C = 1.0 mA _{dc} , f = 1.0 kHz)	h _{ie}	1	–	10	kΩ
Voltage Feedback Ratio (V _{CE} = 10 Vdc, I _C = 1.0 mA _{dc} , f = 1.0 kHz)	h _{re}	0.5	–	8	X 10 ⁻⁴
Small–Signal Current Gain (V _{CE} = 10 Vdc, I _C = 1.0 mA _{dc} , f = 1.0 kHz)	h _{fe}	100	–	400	
Output Admittance (V _{CE} = 10 Vdc, I _C = 1.0 mA _{dc} , f = 1.0 kHz)	h _{oe}	1	–	40	μmhos
Noise Figure (V _{CE} =5V, I _C =100μA, R _S =1.0kΩ, f=1.0kHz)	NF	–	–	5	dB

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

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●ELECTRICAL CHARACTERISTICS (Ta= 25°C)

SWITCHING CHARACTERISTICS

Delay Time	(V _{CC} = 3.0 Vdc, V _{BE} = -0.5 Vdc, I _C = 10 mA, I _{B1} = 1.0 mA)	t _d	-	-	35	ns
Rise Time		t _r	-	-	35	
Storage Time	(V _{CC} = 3.0 Vdc, I _C = 10 mA, I _{B1} = I _{B2} = 1.0 mA)	t _s	-	-	200	
Fall Time		t _f	-	-	50	

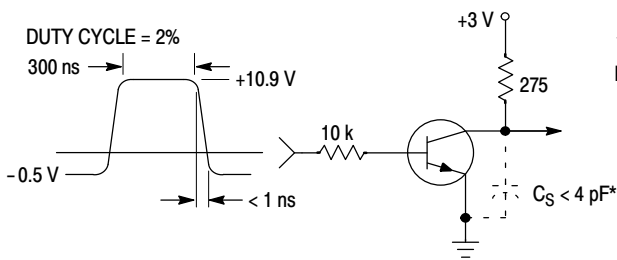


Figure 1. Delay and Rise Time Equivalent Test Circuit

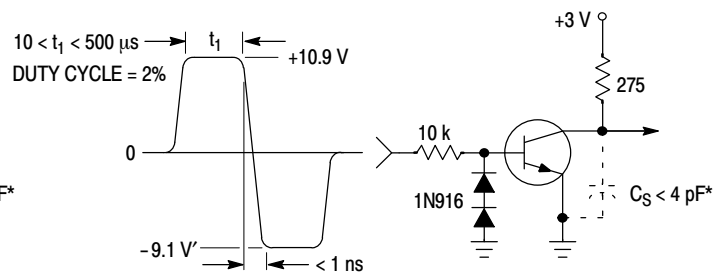


Figure 2. Storage and Fall Time Equivalent Test Circuit

* Total shunt capacitance of test jig and connectors

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ELECTRICAL CHARACTERISTICS CURVES

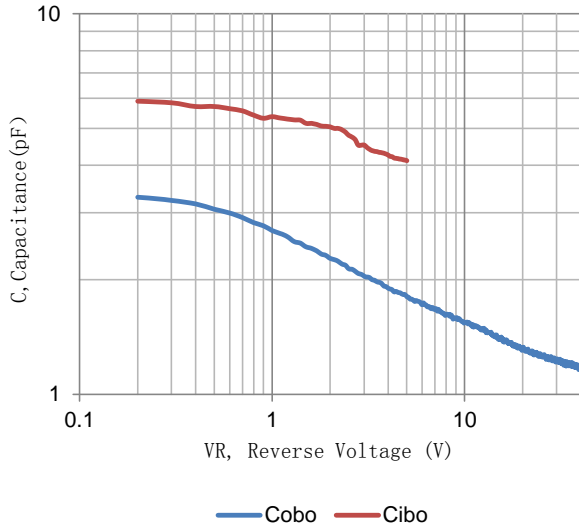


Figure 3. Capacitance

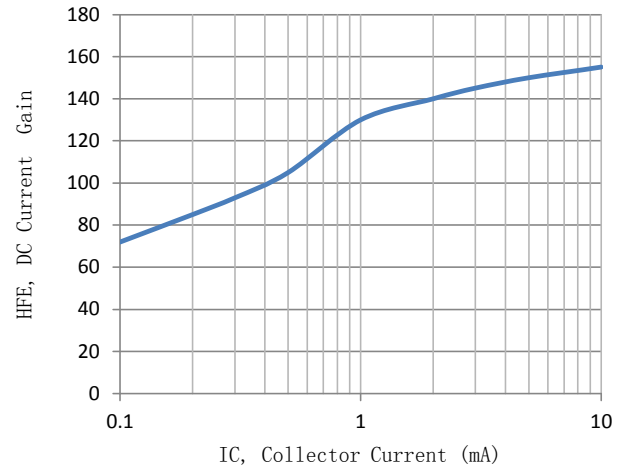


Figure 4. Current Gain

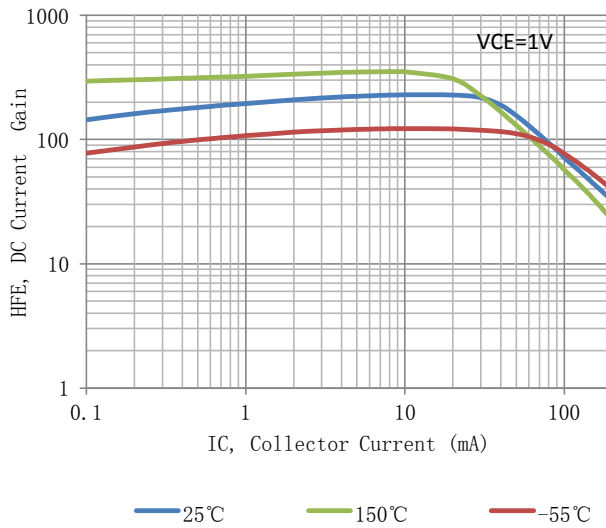


Figure 5. DC Current Gain

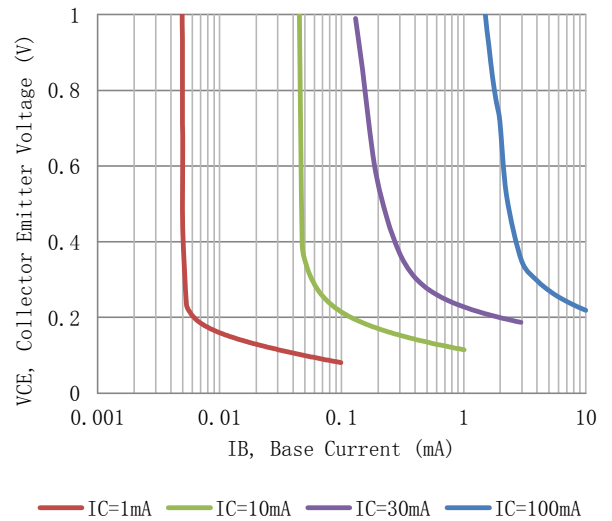


Figure 6. Collector Saturation Region

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ELECTRICAL CHARACTERISTICS CURVES

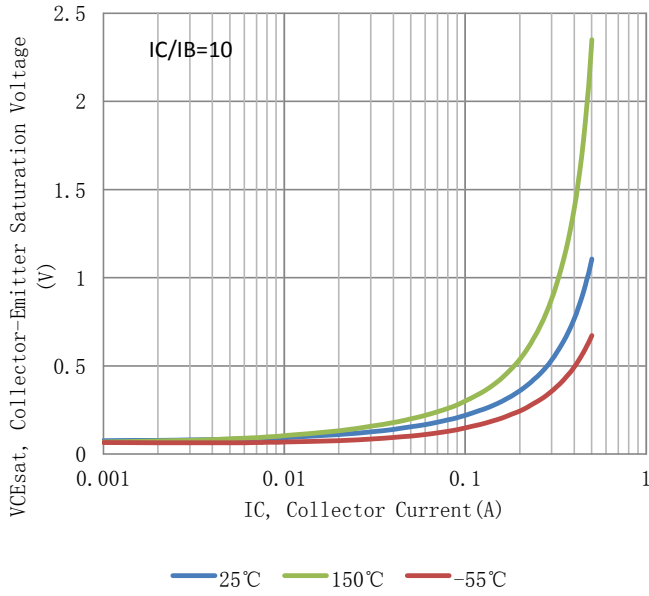


Figure 7. $V_{CE(sat)}$ vs I_C

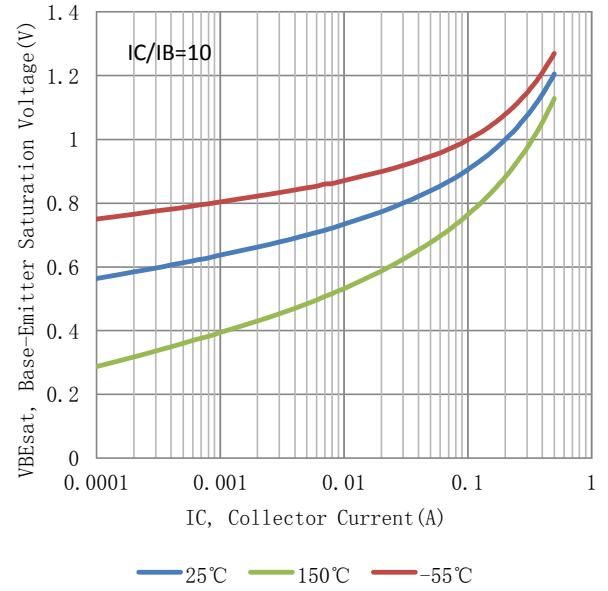


Figure 8. $V_{BE(sat)}$ vs I_C

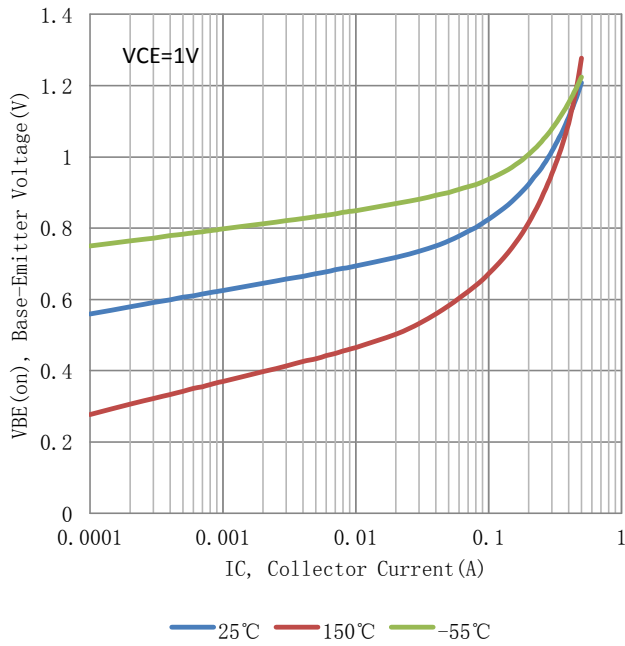
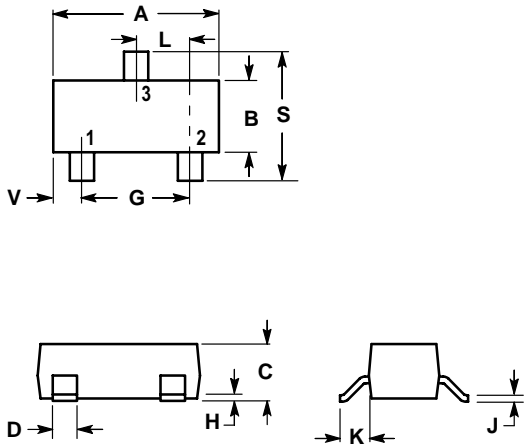


Figure 9. $V_{BE(on)}$ vs I_C

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SOT-23



NOTES:

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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.50
G	0.0701	0.0807	1.78	2.04
H	0.0005	0.0040	0.013	0.100
J	0.0034	0.0070	0.085	0.177
K	0.0140	0.0285	0.35	0.69
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.1039	2.10	2.64
V	0.0177	0.0236	0.45	0.60

- PIN 1. BASE
 2. EMITTER
 3. COLLECTOR

