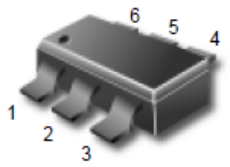
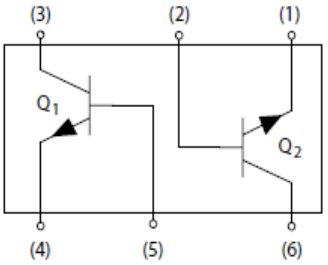
Dual General Purpose Transistors

LMBT3904DW1T1G
S-LMBT3904DW1T1G

The LMBT3904DW1T1G device is a spin–off of our popular SOT–23/SOT–323 three–leaded device. It is designed for general purpose amplifier applications and is housed in the SOT–363 six–leaded surface mount package. By putting two discrete devices in one package , this device is ideal for low–power surface mount applications where board space is at a premium.



SC-88



●FEATURES

1)Low VCE(sat), ≤ 0.4 V
2)Simplifies Circuit Design
3)Reduces Board Space
4)Reduces Component Count
5)Available in 8 mm, 7–inch/3,000 Unit Tape and Reel
6)hFE, 100–300
7)We declare that the material of product compliant with RoHS requirements and Halogen Free.
8) S- Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

●DEVICE MARKING AND ORDERING INFORMATION

Device	Marking	Shipping
LMBT3904DW1T1G	MA	3000/Tape&Reel
LMBT3946DW1T3G	MA	10000/Tape&Reel

●MAXIMUM RATINGS(Ta = 25℃)

Parameter	Symbol	Limits	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

Total Device Dissipation, FR−5 Board (Note 1) @ T_A = 25°C	P_D	150	mW
Thermal Resistance, Junction–to–Ambient(Note 1)	$R_{\Theta JA}$	833	℃/W
Junction and Storage temperature	T_J,T_{stg}	−55～+150	℃

1. Device mounted on FR4 glass epoxy printed circuit board using the minimum recommended footprint.

LMBT3904DW1T1G，S-LMBT3904DW1T1G

●ELECTRICAL CHARACTERISTICS (Ta= 25℃)

OFF CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Collector–Emitter Breakdown Voltage (I_C = 1.0 mAdc, I_B = 0)	$V_{BR(CEO)}$	40	–	–	V
Collector–Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	$V_{BR(CBO)}$	60	–	–	V
Emitter–Base Breakdown Voltage (I_E = 10 μAdc, 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 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	$V_{CE(sat)}$				V
(I_C = 10 mAdc, I_B = 1.0 mAdc)		–	–	0.2	
(I_C = 50mAdc, I_B = 5.0 mAdc)		–	–	0.3	
Base–Emitter Saturation Voltage	$V_{BE(sat)}$				V
(I_C = 10 mAdc, I_B = 1.0 mAdc)		0.65	–	0.85	
(I_C = 50mAdc, I_B = 5.0 mAdc)		–	–	0.95	

SMALL–SIGNAL CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Current–Gain — Bandwidth Product (I_C = 10mAdc, 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 mAdc, f = 1.0 kHz)	h_{ie}	1	–	10	k Ω
Voltage Feedback Ratio (V_{CE}= 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)	h_{re}	0.5	–	8	X 10^{-4}
Small–Signal Current Gain (V_{CE}= 10 Vdc, I_C = 1.0 mAdc, f = 1.0 kHz)	h_{fe}	100	–	400	
Output Admittance (V_{CE}= 10 Vdc, I_C = 1.0 mAdc, 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

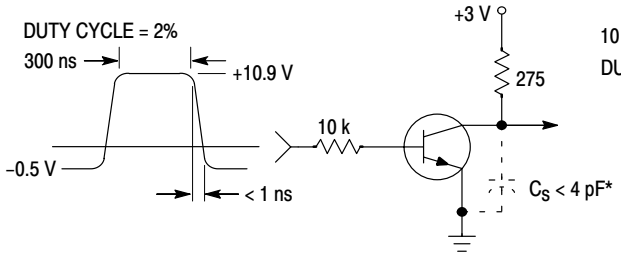
2. Pulse Test: Pulse Width <300 μs, Duty Cycle <2.0%.

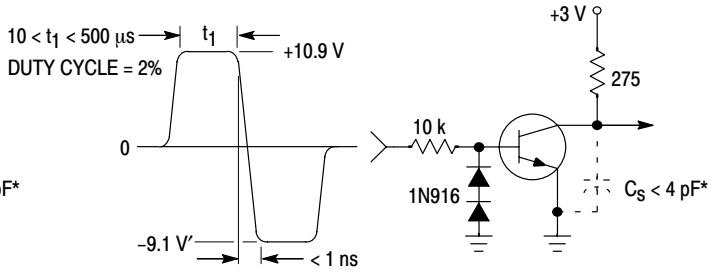
LMBT3904DW1T1G，S-LMBT3904DW1T1G

●ELECTRICAL CHARACTERISTICS (Ta= 25℃)(CONTINUED)

SWITCHING CHARACTERISTICS

Delay Time	(V_{CC} = 3.0 Vdc, V_{BE}= – 0.5 Vdc,I_C = 10 mAdc, I_{B1} = 1.0 mAdc)	t_d	–	–	35	ns
Rise Time		t_r	–	–	35	
Storage Time	(V_{CC} = 3.0 Vdc, I_C = 10 mAdc,I_{B1} = I_{B2} = 1.0 mAdc)	t_s	–	–	200	
Fall Time		t_f	–	–	50	





* Total shunt capacitance of test jig and connectors

Figure 1. Delay and Rise Time Equivalent Test Circuit

Figure 2. Storage and Fall Time Equivalent Test Circuit

LMBT3904DW1T1G，S-LMBT3904DW1T1G

ELRCTRICAL CHARACTERISTICS CURVES

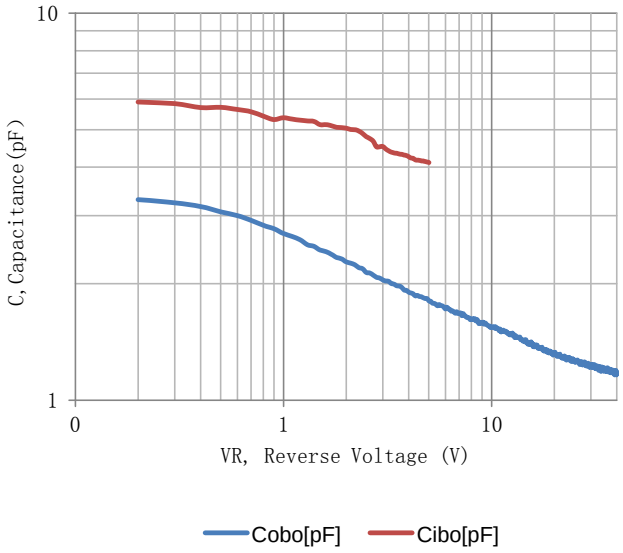


FIG.3 Capacitance

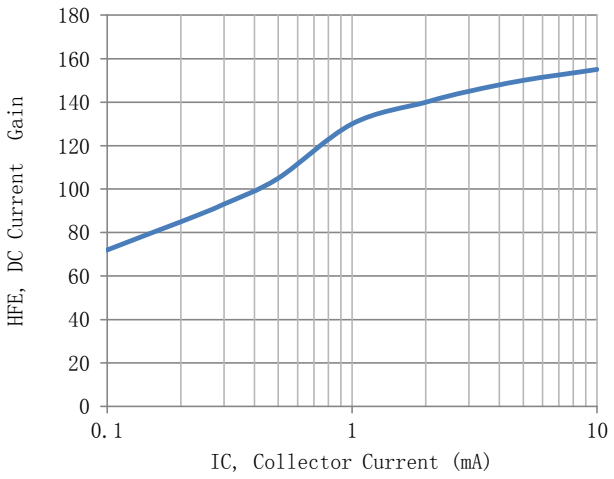


FIG.4 Current Gain

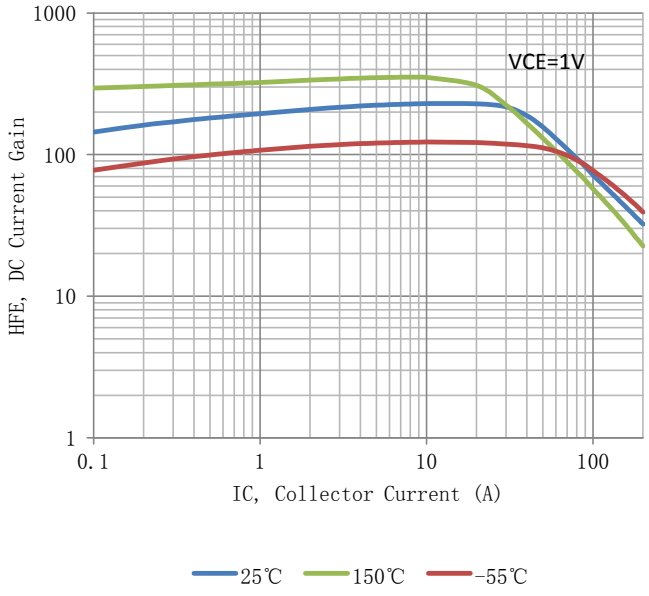


FIG.5 DC Current Gain

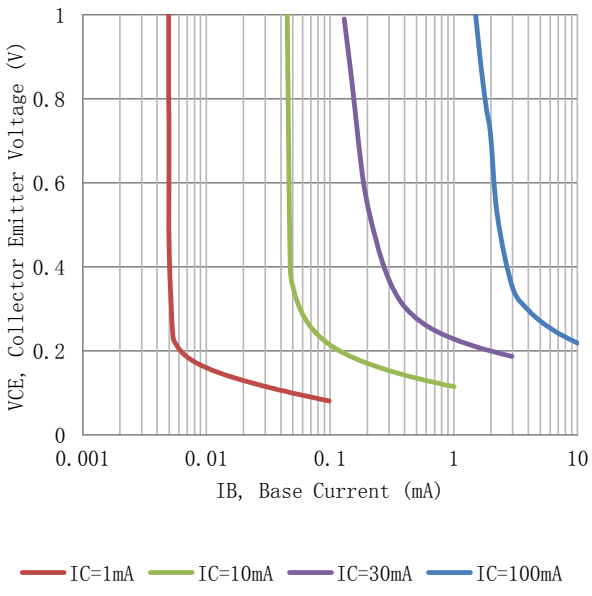


FIG.6 Collector Saturation Region

LMBT3904DW1T1G，S-LMBT3904DW1T1G

ELRCTRICAL CHARACTERISTICS CURVES

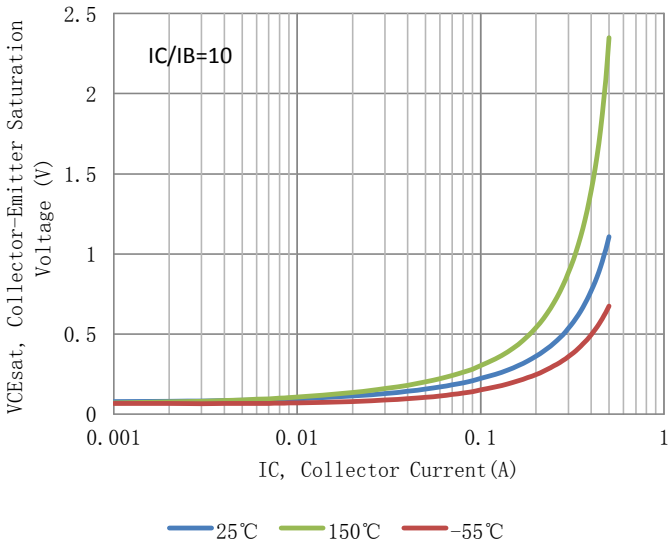


FIG.7 VCE(sat) vs. IC

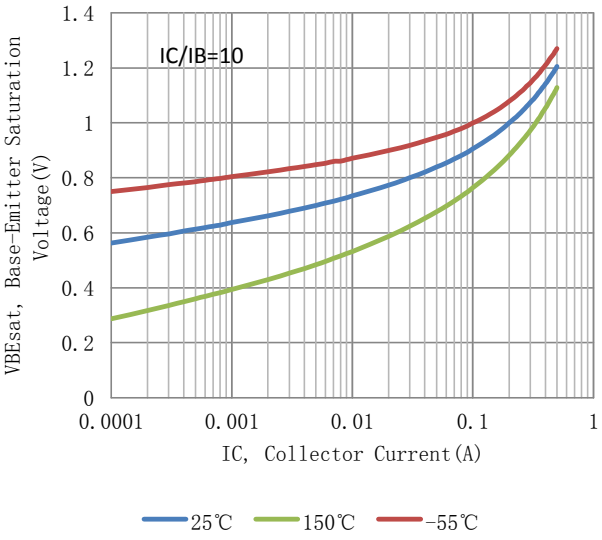


FIG.8 VBE(sat) vs. IC

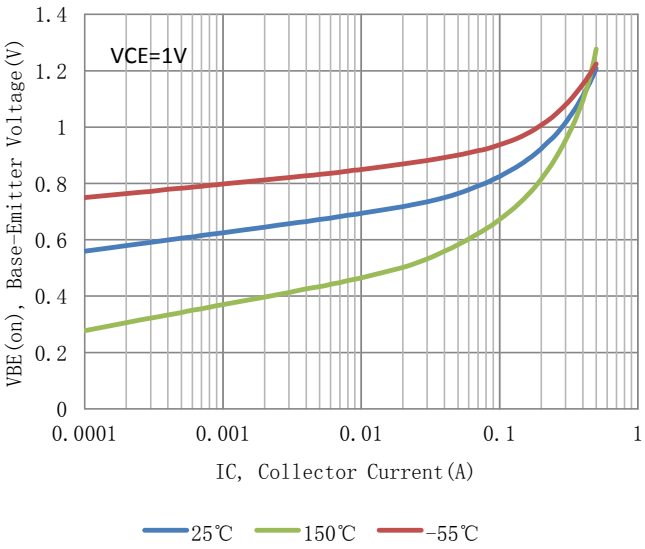
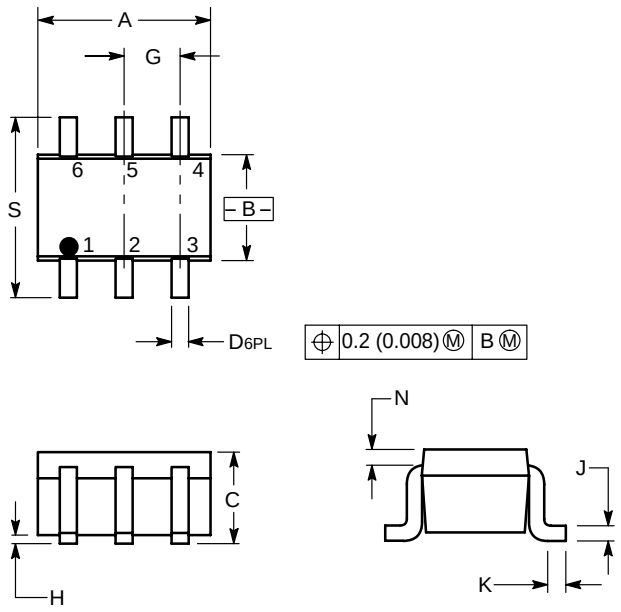


FIG.9 VBE(on) vs. IC

LMBT3904DW1T1G，S-LMBT3904DW1T1G

SC-88



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	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20

PIN 1. EMITTER 2
2. BASE 2
3. COLLECTOR 1
4.EMITTER 1
5. BASE 1
6.COLLECTOR 2