

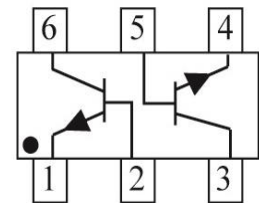
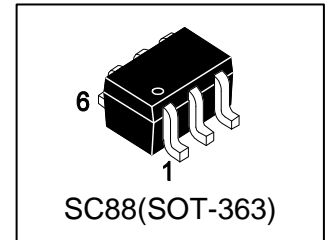
# LMBT3904DW1T1G

## S-LMBT3904DW1T1G

General Purpose Transistors NPN Silicon

### 1. FEATURES

- We declare that the material of product compliance with RoHS requirements and Halogen Free.
- S- prefix for automotive and other applications requiring unique site and control change requirements; AEC-Q101 qualified and PPAP capable.
- Low  $V_{CE(sat)}$ ,  $\leq 0.4$  V
- Simplifies circuit design
- Reduces board space
- Reduces component count
- Available in 8 mm, 7-inch/3,000 unit tape and reel
- $h_{FE}$ , 100–300



### 2. DEVICE MARKING AND ORDERING INFORMATION

Device	Marking	Shipping
LMBT3904DW1T1G	MA	3000/Tape&Reel
LMBT3904DW1T3G	MA	10000/Tape&Reel

### 3. MAXIMUM RATINGS( $T_a = 25^\circ\text{C}$ )

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

### 4. THERMAL CHARACTERISTICS

Parameter	Symbol	Limits	Unit
Total Device Dissipation, FR-5 Board (Note 1) @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	PD	150 1.2	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction–to–Ambient(Note 1)	$R_{\theta JA}$	833	$^\circ\text{C}/\text{W}$
Junction and Storage temperature	$T_J, T_{stg}$	$-55 \sim +150$	$^\circ\text{C}$

1. FR-5 =  $1.0 \times 0.75 \times 0.062$  in.

**5. ELECTRICAL CHARACTERISTICS (Ta= 25°C)**
**OFF CHARACTERISTICS**

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Collector–Emitter Breakdown Voltage (IC = 1.0 mA <sub>dc</sub> , IB = 0)	VBR(CEO)	40	-	-	V
Collector–Base Breakdown Voltage (IC = 10 μA <sub>dc</sub> , IE = 0)	VBR(CBO)	60	-	-	V
Emitter–Base Breakdown Voltage (IE = 10 μA <sub>dc</sub> , IC = 0)	VBR(EBO)	6	-	-	V
Collector Cutoff Current ( VCE = 30 Vdc, VEB = 3.0Vdc)	ICEX	-	-	50	nA
Base Cutoff Current (VCE = 30 Vdc, VEB = 3.0Vdc)	IBL	-	-	50	nA

**ON CHARACTERISTICS (Note 2.)**

DC Current Gain (IC = 0.1 mA <sub>dc</sub> , VCE = 1.0 Vdc) (IC = 1.0 mA <sub>dc</sub> , VCE = 1.0 Vdc) (IC = 10 mA <sub>dc</sub> , VCE = 1.0 Vdc) (IC = 50 mA <sub>dc</sub> , VCE = 1.0 Vdc) (IC = 100 mA <sub>dc</sub> , VCE = 1.0 Vdc)	HFE	40 70 100 60 30	- - - - -	- - 300 - -	
Collector–Emitter Saturation Voltage (IC = 10 mA <sub>dc</sub> , IB = 1.0 mA <sub>dc</sub> ) (IC = 50 mA <sub>dc</sub> , IB = 5.0 mA <sub>dc</sub> )	VCE(sat)	- -	- -	0.2 0.3	V
Base–Emitter Saturation Voltage (IC = 10 mA <sub>dc</sub> , IB = 1.0 mA <sub>dc</sub> ) (IC = 50 mA <sub>dc</sub> , IB = 5.0 mA <sub>dc</sub> )	VBE(sat)	0.65 -	- -	0.85 0.95	V

**SMALL–SIGNAL CHARACTERISTICS**

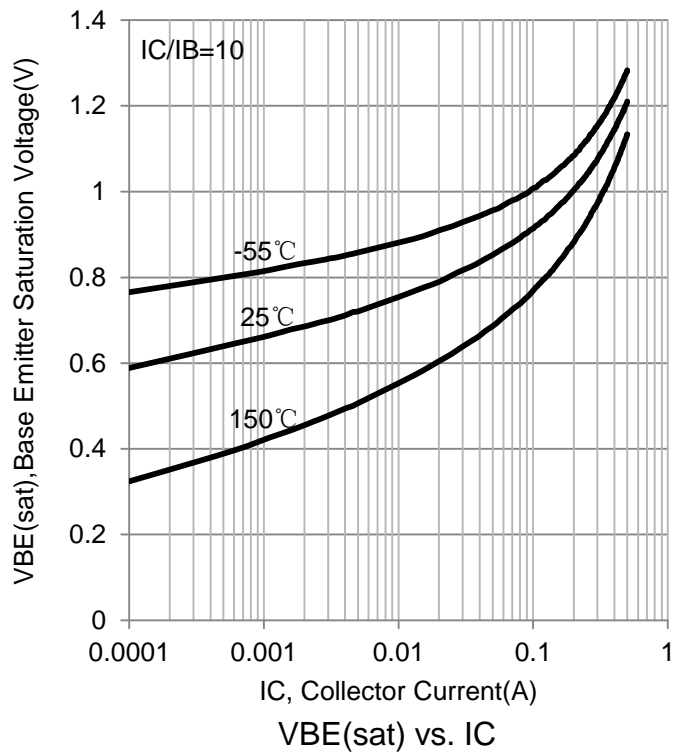
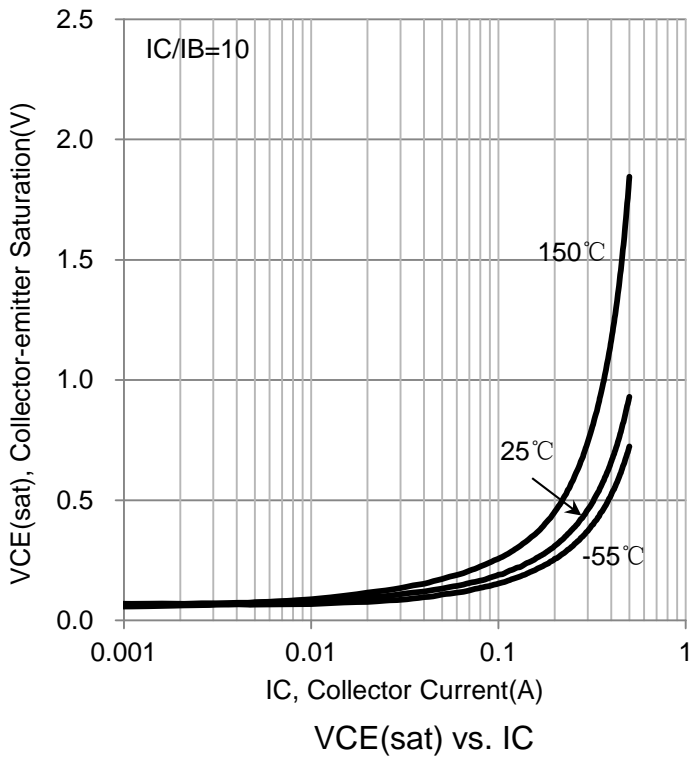
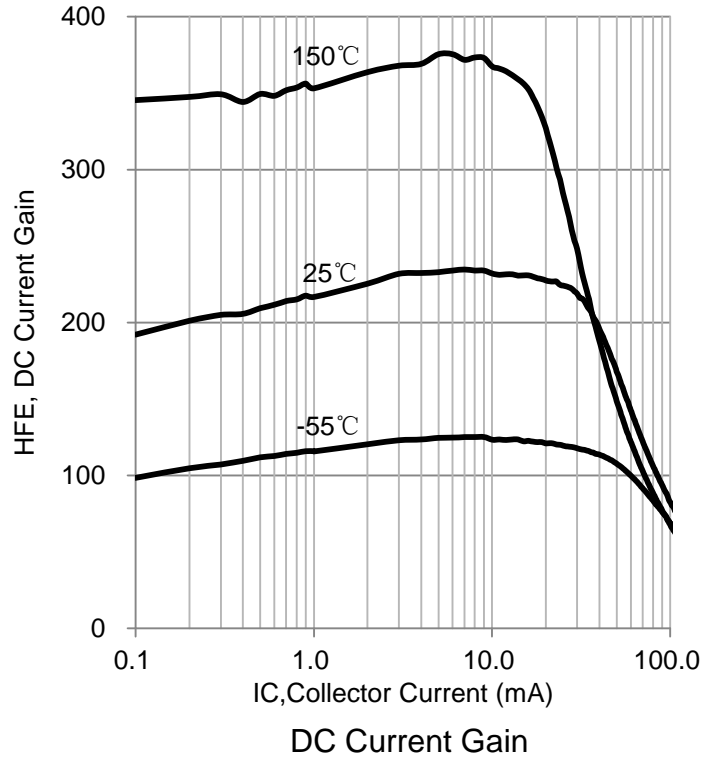
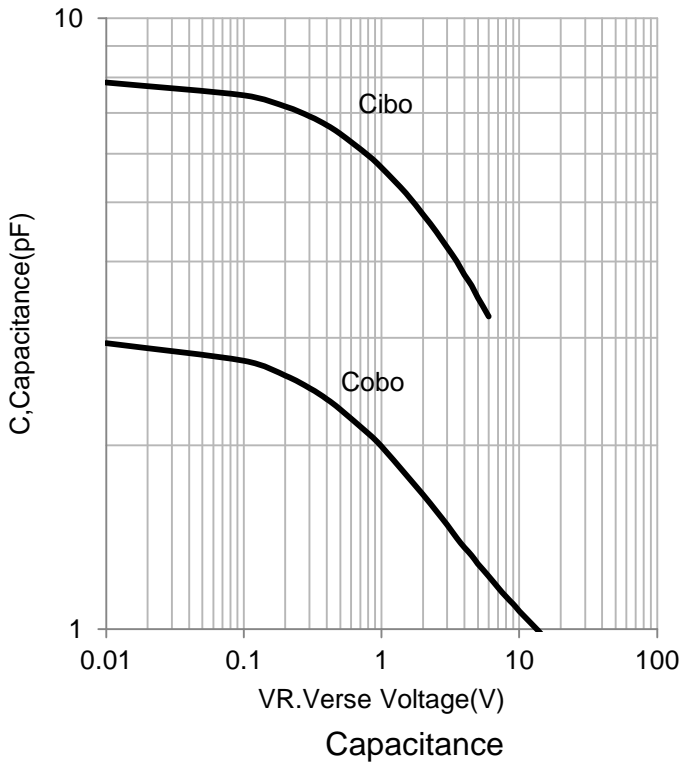
Current–Gain — Bandwidth Product (IC = 10mA <sub>dc</sub> , VCE= 20Vdc, f = 100MHz)	fT	300	-	-	MHz
Output Capacitance (VCB = 5.0 Vdc, IE = 0, f = 1.0 MHz)	Cobo	-	-	4	pF
Input Capacitance (VEB = 0.5 Vdc, IC = 0, f = 1.0 MHz)	Cibo	-	-	8	pF
Input Impedance (VCE= 10 Vdc, IC = 1.0 mA <sub>dc</sub> , f = 1.0 kHz)	hie	1	-	10	k Ω
Voltage Feedback Ratio (VCE= 10 Vdc, IC = 1.0 mA <sub>dc</sub> , f = 1.0 kHz)	hre	0.5	-	8	X 10 <sup>-4</sup>
Small–Signal Current Gain (VCE= 10 Vdc, IC = 1.0 mA <sub>dc</sub> , f = 1.0 kHz)	hfe	100	-	400	
Output Admittance (VCE= 10 Vdc, IC = 1.0 mA <sub>dc</sub> , f = 1.0 kHz)	hoe	1	-	40	μmhos
Noise Figure (VCE =5V, IC =100μA, RS =1.0kΩ, f =1.0kHz)	NF	-	-	5	dB

**SWITCHING CHARACTERISTICS**

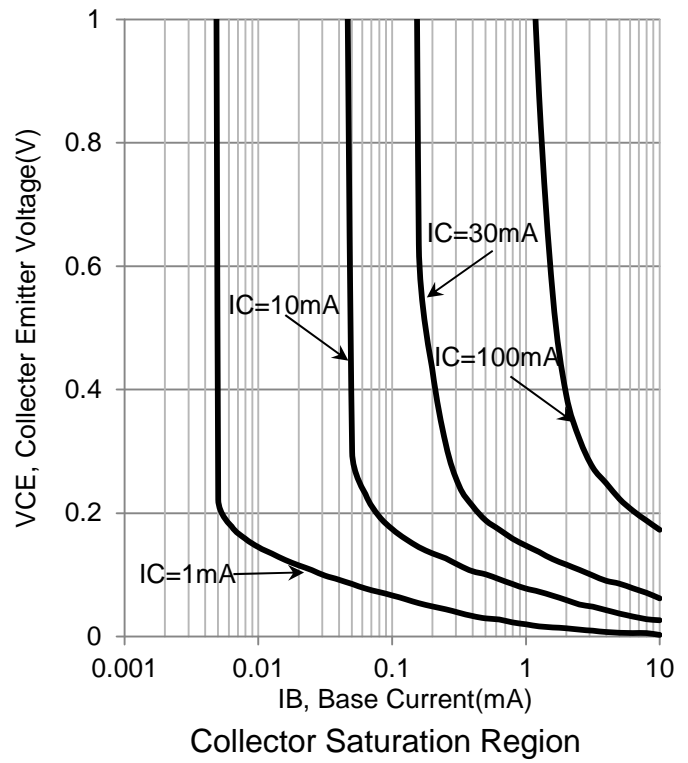
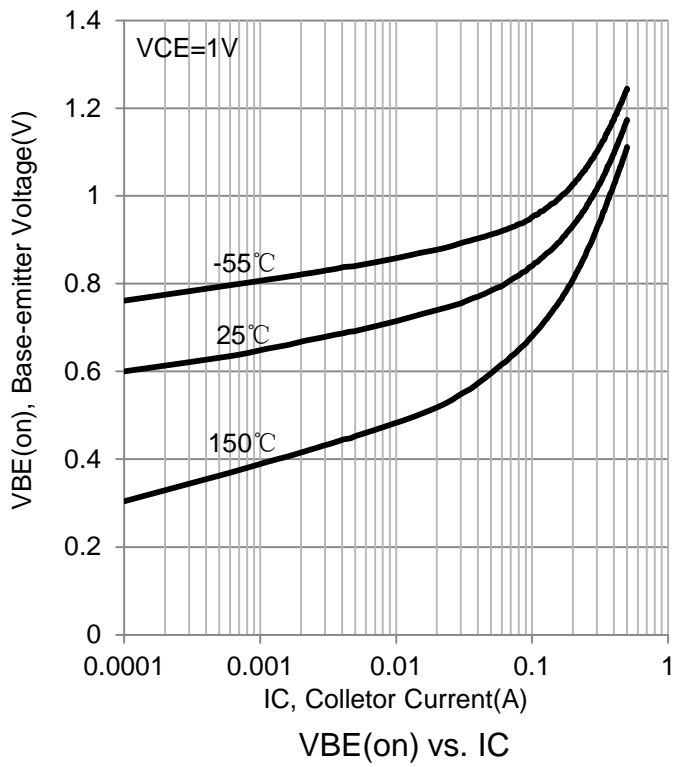
Delay Time	(VCC = 3.0 Vdc, VBE=-0.5Vdc, IC = 10mA <sub>dc</sub> , IB1 = 1.0 mA <sub>dc</sub> )	td	-	-	35	ns
Rise Time		tr	-	-	35	
Storage Time	(VCC = 3.0 Vdc, IC = 10 mA <sub>dc</sub> , IB1 = IB2 = 1.0 mA <sub>dc</sub> )	ts	-	-	200	
Fall Time		tf	-	-	50	

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

**6. ELECTRICAL CHARACTERISTICS CURVES**



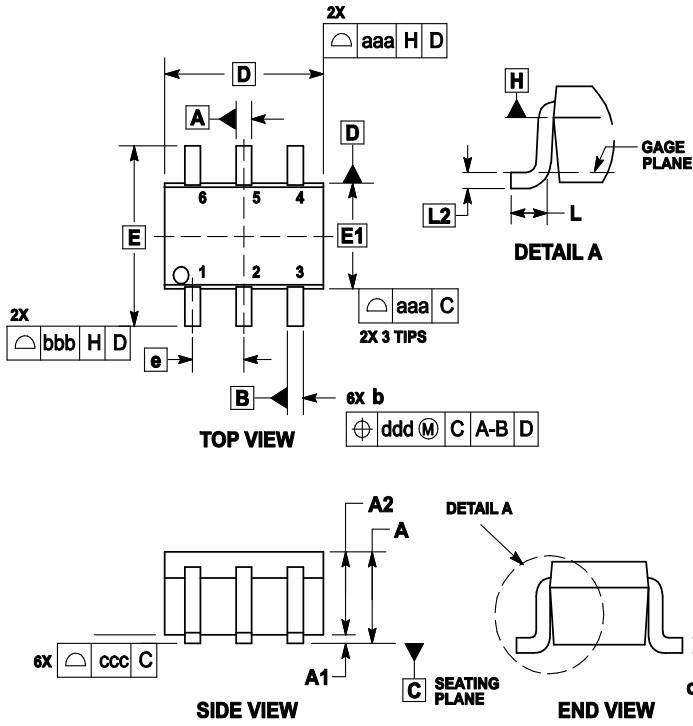
**6. ELECTRICAL CHARACTERISTICS CURVES**



### 7. OUTLINE AND DIMENSIONS

Notes:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.



DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	---	---	1.10	---	---	0.04
A1	0.00	---	0.10	0	---	0
A2	0.70	0.90	1.00	0.03	0.04	0.04
b	0.15	0.20	0.25	0.01	0.01	0.01
C	0.08	0.15	0.22	0	0.01	0.01
D	1.80	2.00	2.20	0.07	0.08	0.09
E	2.00	2.10	2.20	0.08	0.08	0.09
E1	1.15	1.25	1.35	0.05	0.05	0.05
e	0.65 BSC			0.026 BSC		
L	0.26	0.36	0.46	#####	0.01	0.02
L2	0.15 BSC			0.006 BSC		
aaa	0.15			0.01		
bbb	0.30			0.01		
ccc	0.10			0.00		
ddd	0.10			0.00		

### 8. SOLDERING FOOTPRINT

