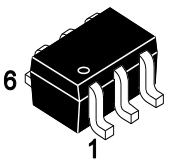
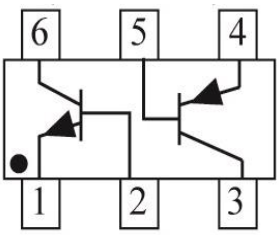
LMBT3946DW1T1G
S-LMBT3946DW1T1G

Dual General Purpose Transistors PNP/NPN Silicon



SC88(SOT-363)



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 VCE(sat), ≤ 0.4 V
- Simplifies circuit design
- Reduces board space
- Reduces component count
- hFE, 100–300

2. DEVICE MARKING AND ORDERING INFORMATION

Device	Marking	Shipping
LMBT3946DW1T1G	46	3000/Tape&Reel
LMBT3946DW1T3G	46	10000/Tape&Reel

3. MAXIMUM RATINGS(Ta = 25ºC)

Parameter(PNP)	Symbol	Limits	Unit
Collector–Emitter Voltage	VCEO	-40	V
Collector–Base Voltage	VCBO	-40	V
Emitter–Base Voltage	VEBO	-5	V
Collector Current — Continuous	IC	-200	mA

Parameter(NPN)	Symbol	Limits	Unit
Collector–Emitter Voltage	VCEO	40	V
Collector–Base Voltage	VCBO	60	V
Emitter–Base Voltage	VEBO	6	V
Collector Current — Continuous	IC	200	mA

4. THERMAL CHARACTERISTICS

Parameter	Symbol	Limits	Unit
Total Device Dissipation, FR−5 Board (Note 1) @ TA = 25ºC Derate above 25ºC	PD	 150 1.2	 mW mW/ºC
Thermal Resistance, Junction–to–Ambient(Note 1)	RΘJA	833	ºC/W
Junction and Storage temperature	TJ,Tstg	−55~+150	ºC

1. FR–5 = 1.0×0.75×0.062 in.

5. ELECTRICAL CHARACTERISTICS (Ta= 25°C)

PNP

OFF CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Collector–Emitter Breakdown Voltage (IC = -1.0 mA, IB = 0)	VBR(CEO)	-40	-	-	V
Collector–Base Breakdown Voltage (IC = -10 μA, IE = 0)	VBR(CBO)	-40	-	-	V
Emitter–Base Breakdown Voltage (IE = -10 μA, IC = 0)	VBR(EBO)	-5	-	-	V
Collector Cutoff Current (VCE = -30 V, VEB = -3.0V)	ICEX	-	-	-50	nA
Base Cutoff Current (VCE = -30 V, VEB = -3.0V)	IBL	-	-	-50	nA
Collector Cutoff Current (VCB = -40 V,IE=0)	ICBO	-	-	-100	nA
Emitter-Base cut-off current (IC = 0, VEB=-6.0V)	IEBO	-	-	-100	nA
Collector-Emitter cutoff Current (VCE=-40V, IB=0)	ICEO	-	-	-10	μA

ON CHARACTERISTICS (Note 2.)

DC Current Gain					
(IC = -0.1 mA, VCE = -1.0 V)	HFE	60	-	-	
(IC = -1.0 mA, VCE = -1.0 V)		80	-	-	
(IC = -10 mA, VCE = -1.0 V)		100	-	300	
(IC = -50 mA, VCE = -1.0 V)		60	-	-	
(IC = -100 mA, VCE = -1.0 V)		30	-	-	
Collector–Emitter Saturation Voltage					
(IC = -10 mA, IB = -1.0 mA)	VCE(sat)	-	-	-0.25	V
(IC = -50 mA, IB = -5.0 mA)		-	-	-0.4	
Base–Emitter Saturation Voltage					
(IC = -10 mA, IB = -1.0 mA)	VBE(sat)	-0.65	-	-0.85	V
(IC = -50 mA, IB = -5.0 mA)		-	-	-0.95	

SMALL–SIGNAL CHARACTERISTICS

Current–Gain — Bandwidth Product (IC = -10mA, VCE= -20V, f = 100MHz)	fT	250	-	-	MHz
Output Capacitance (VCB = -5.0 V, IE = 0, f = 1.0 MHz)	Cobo	-	-	4.5	pF
Input Capacitance (VEB = -0.5 V, IC = 0, f = 1.0 MHz)	Cibo	-	-	10	pF

SWITCHING CHARACTERISTICS

Delay Time	(VCC = -3.0 V,VBE=0.5V, IC = -10mA, IB1 = -1.0 mA)	td	-	-	35	ns
Rise Time		tr	-	-	35	
Storage Time	(VCC = -3.0 V, IC = -10 mA,IB1 = IB2 = -1.0 mA)	ts	-	-	225	
Fall Time		tf	-	-	75	

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

5. ELECTRICAL CHARACTERISTICS (Ta= 25°C)

NPN

OFF CHARACTERISTICS

Characteristic	Symbol	Min.	Typ.	Max.	Unit
Collector–Emitter Breakdown Voltage (IC = 1.0 mA, IB = 0)	VBR(CEO)	40	-	-	V
Collector–Base Breakdown Voltage (IC = 10 μA, IE = 0)	VBR(CBO)	60	-	-	V
Emitter–Base Breakdown Voltage (IE = 10 μA, IC = 0)	VBR(EBO)	6	-	-	V
Collector Cutoff Current (VCE = 30 V, VEB = 3.0V)	ICEX	-	-	50	nA
Base Cutoff Current (VCE = 30 V, VEB = 3.0V)	IBL	-	-	50	nA
Collector Cutoff Current (VCB = 60 V,IE=0)	ICBO	-	-	100	nA
Emitter-Base cut-off current (IC = 0, VEB=6.0V)	IEBO	-	-	100	nA
Collector-Emitter cutoff Current (VCE＝40V, IB=0)	ICEO	-	-	10	μA

ON CHARACTERISTICS (Note 3.)

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

SMALL–SIGNAL CHARACTERISTICS

Current–Gain — Bandwidth Product (IC = 10mA, VCE= 20V, f = 100MHz)	fT	300	-	-	MHz
Output Capacitance (VCB = 5.0 V, IE = 0, f = 1.0 MHz)	Cobo	-	-	4	pF
Input Capacitance (VEB = 0.5 V, IC = 0, f = 1.0 MHz)	Cibo	-	-	8	pF

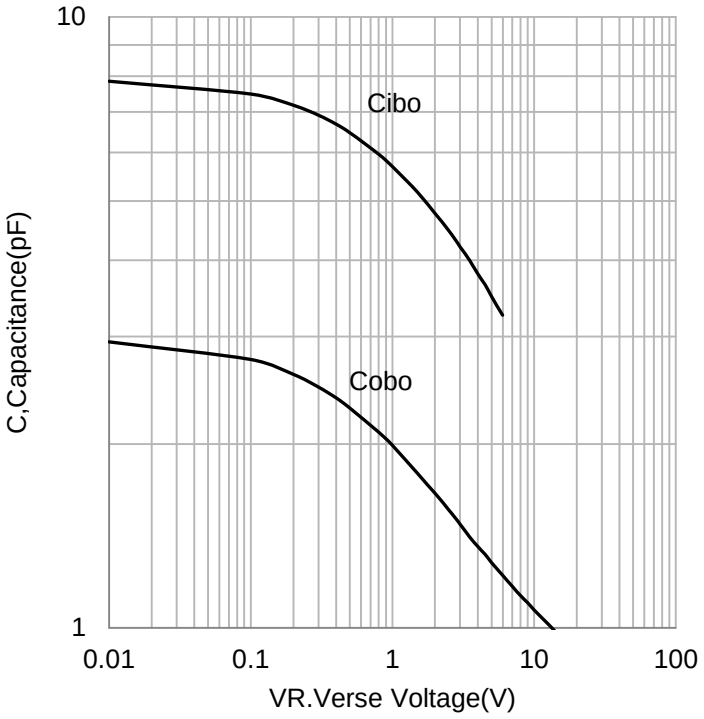
SWITCHING CHARACTERISTICS

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

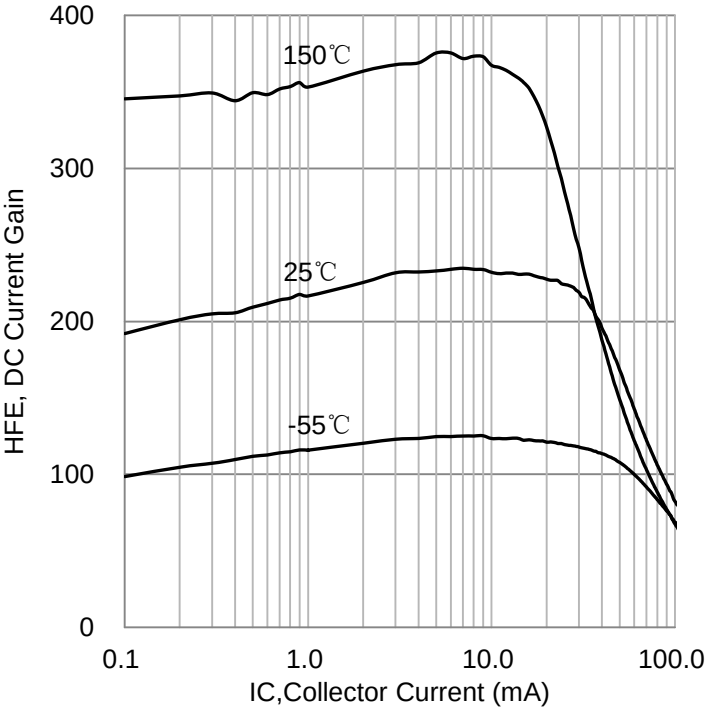
3.Pulse Test: Pulse Width ≤300 μs, Duty Cycle ≤2.0%.

6.ELECTRICAL CHARACTERISTICS CURVES

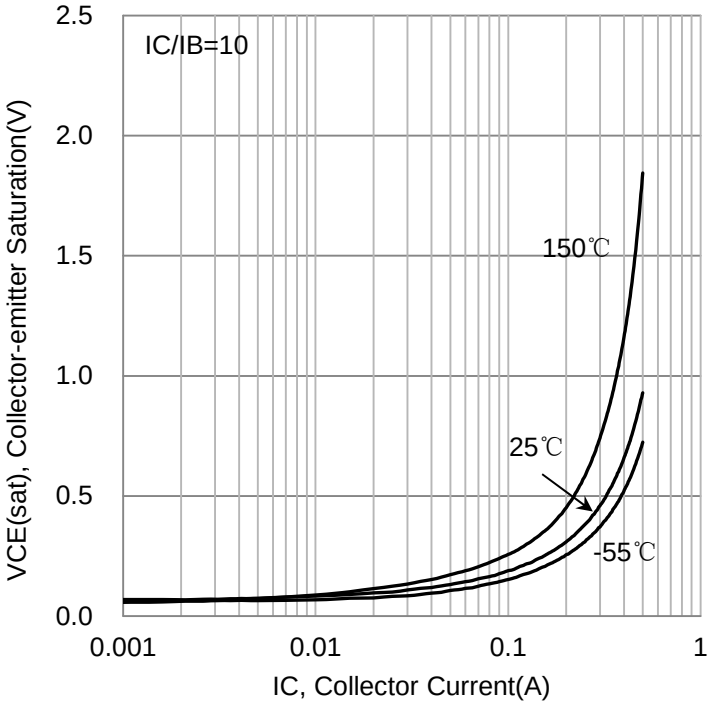
NPN



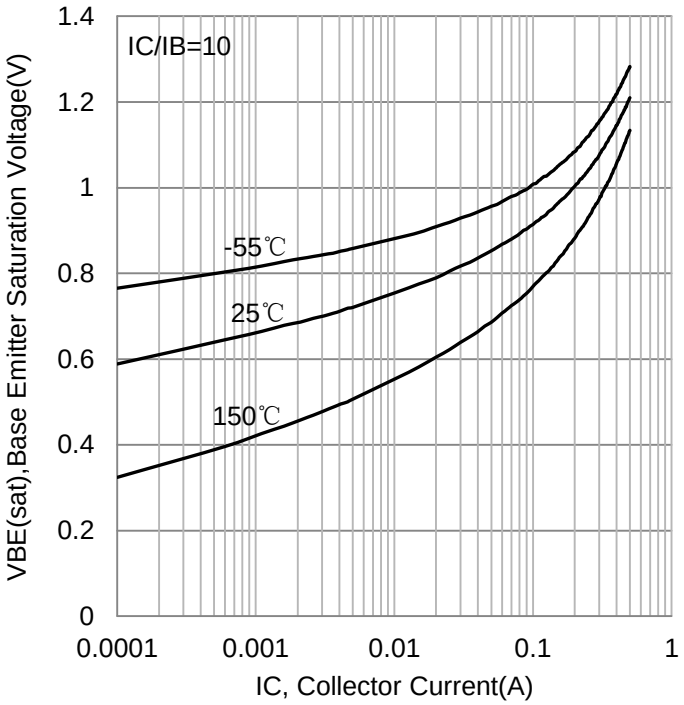
Capacitance



DC Current Gain



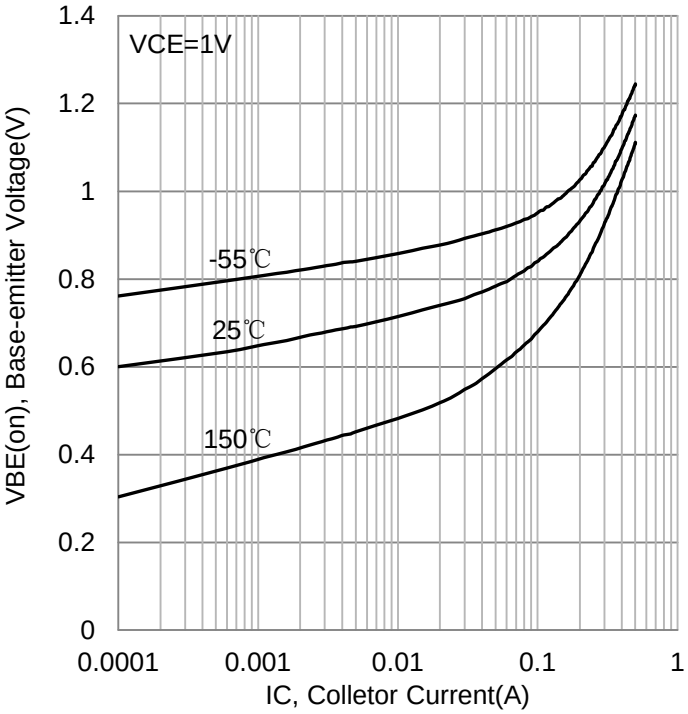
VCE(sat) vs. IC



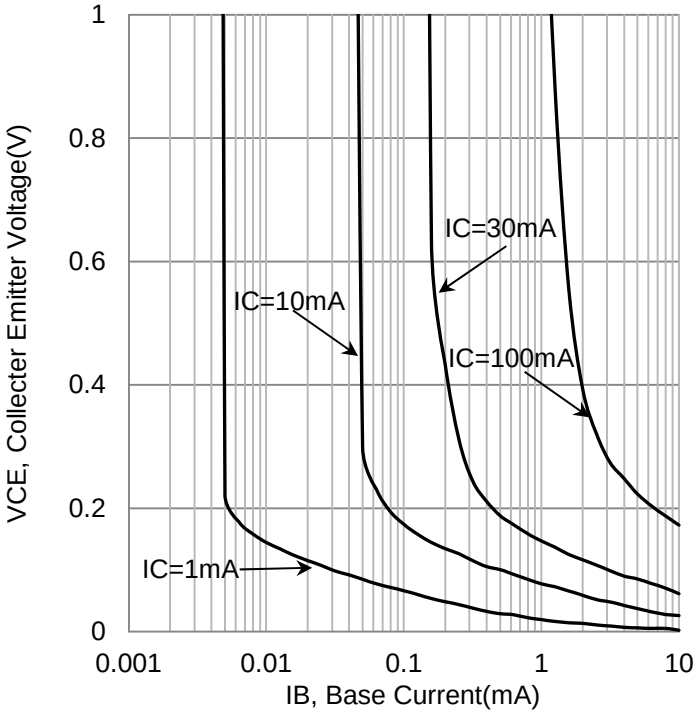
VBE(sat) vs. IC

6.ELECTRICAL CHARACTERISTICS CURVES

NPN



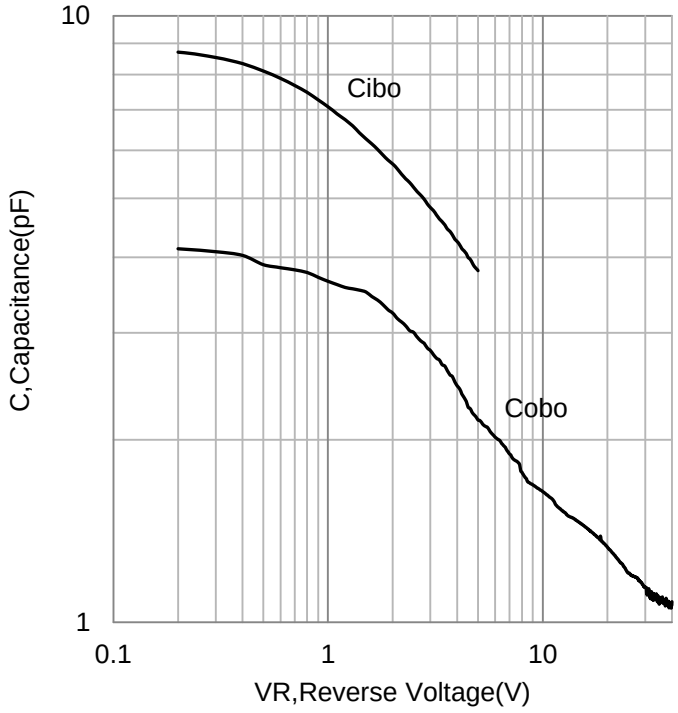
VBE(on) vs. IC



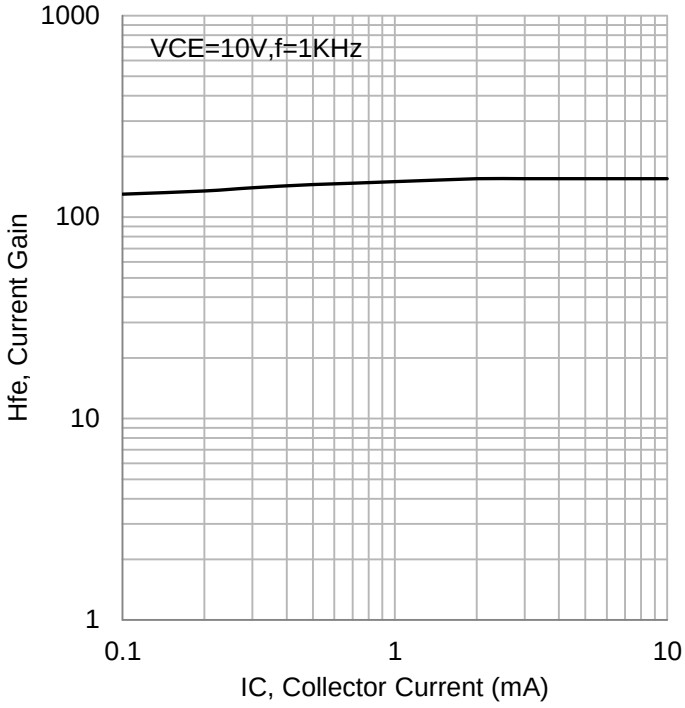
Collector Saturation Region

6.ELECTRICAL CHARACTERISTICS CURVES

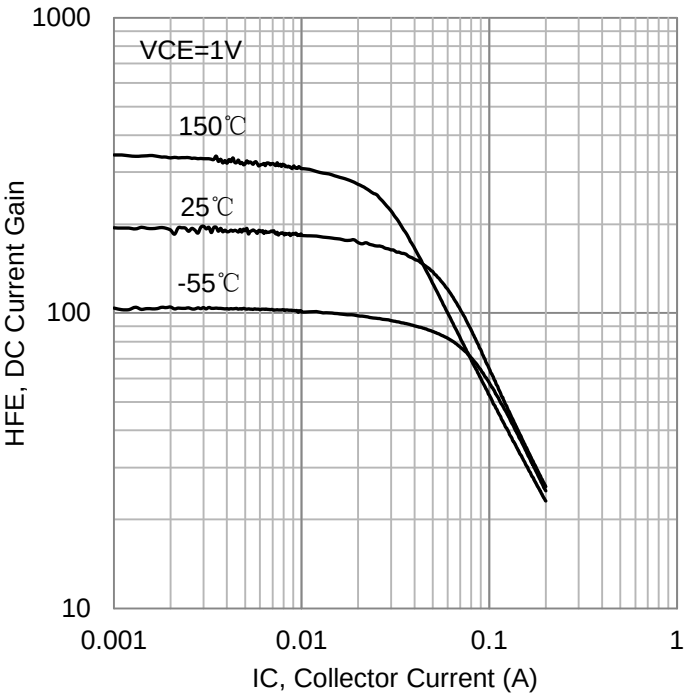
PNP



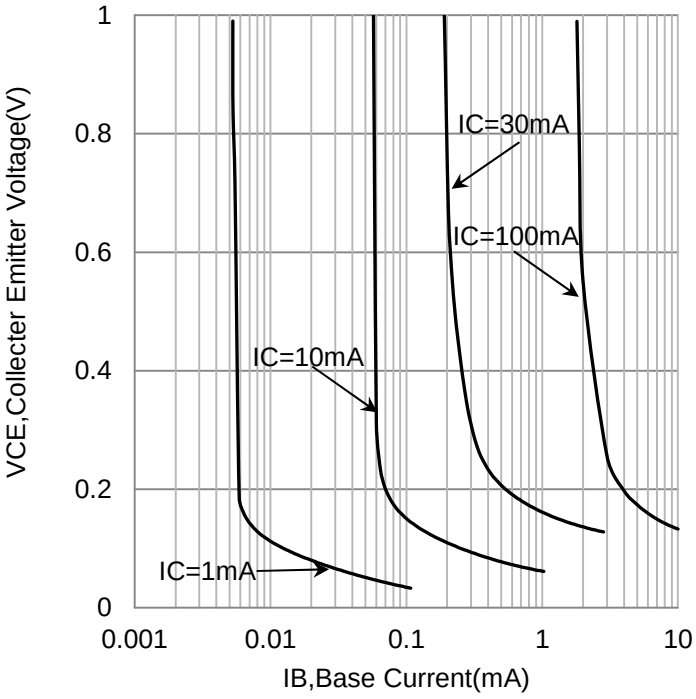
Capacitance



Current Gain



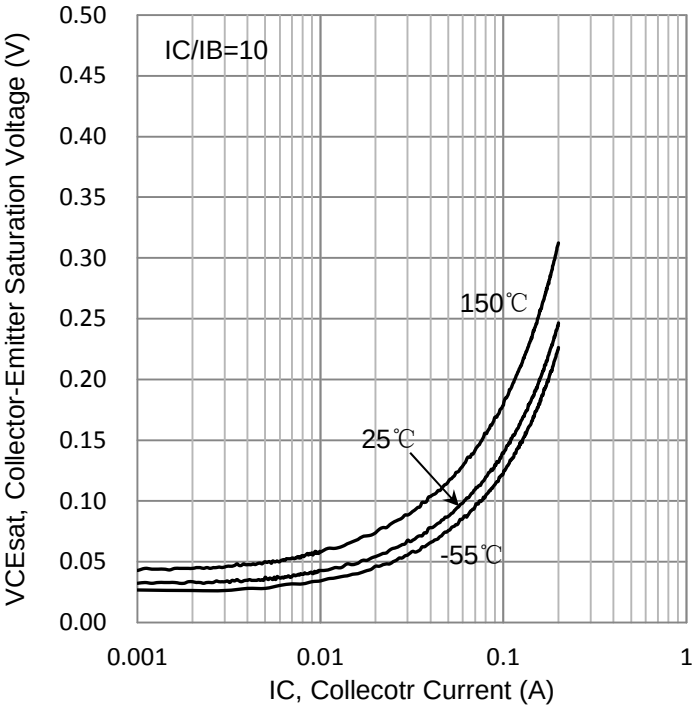
DC Current Gain



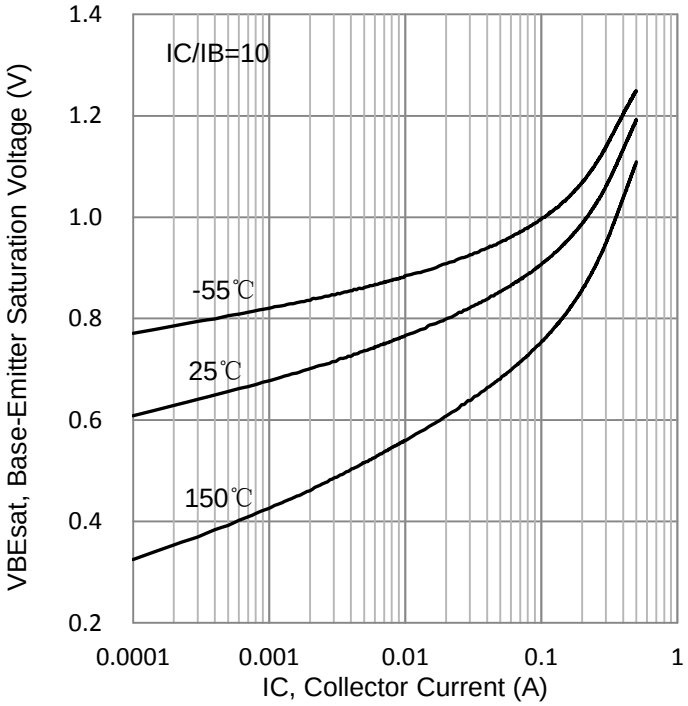
Collector Saturation Region

6.ELECTRICAL CHARACTERISTICS CURVES

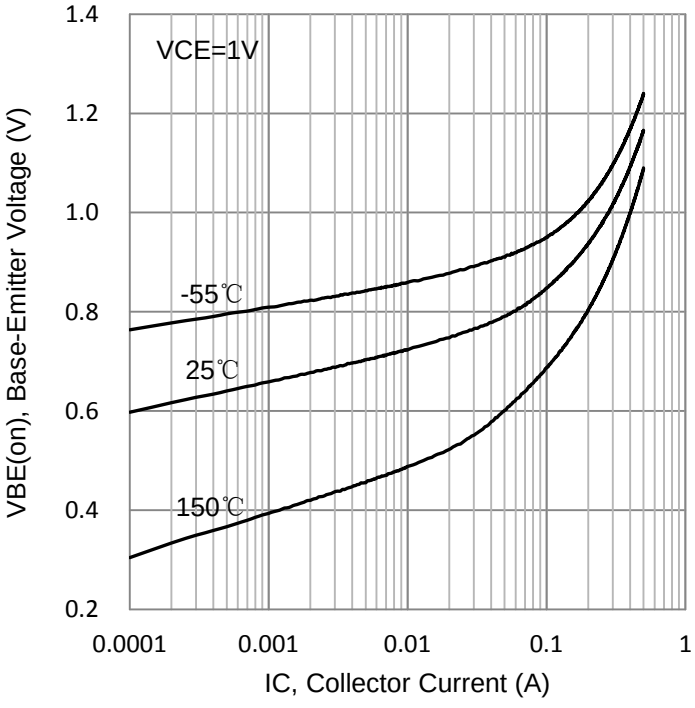
PNP



VCE(sat) vs. IC

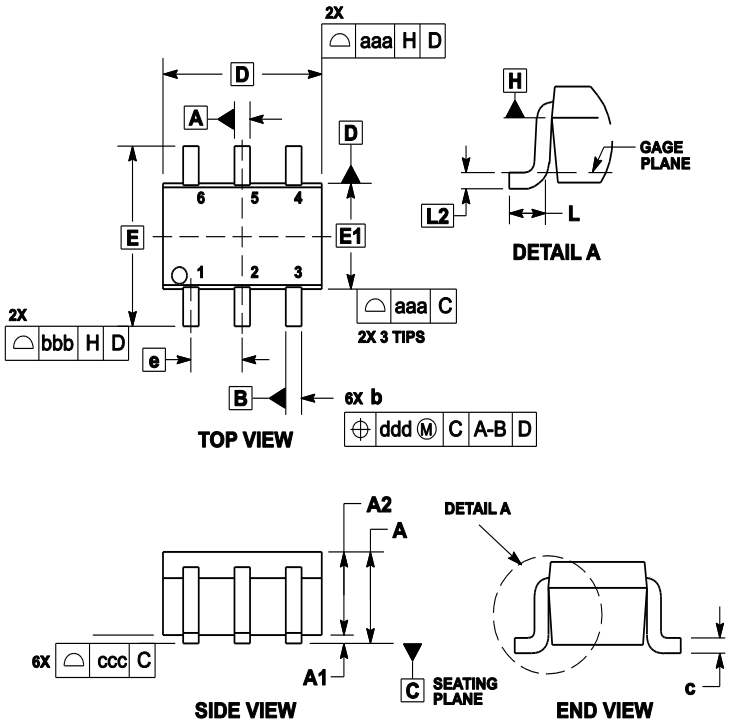


VBE(sat) vs. IC



VBE(on) vs. IC

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 E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	---	---	1.10	---	---	0.043
A1	0.00	---	0.10	0	---	0.004
A2	0.70	0.90	1.00	0.027	0.035	0.039
b	0.15	0.20	0.25	0.006	0.008	0.01
C	0.08	0.15	0.22	0.003	0.006	0.009
D	1.80	2.00	2.20	0.07	0.078	0.086
E	2.00	2.10	2.20	0.078	0.082	0.086
E1	1.15	1.25	1.35	0.045	0.049	0.053
e	0.65 BSC			0.026 BSC		
L	0.26	0.36	0.46	0.010	0.014	0.018
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