

# Dual General Purpose Transistors

## NPN/PNP Duals (Complimentary)

These transistors are designed for general purpose amplifier applications. They are housed in the SOT-363/SC-88 which is designed for low power surface mount applications.

We declare that the material of product compliance with RoHS requirements.

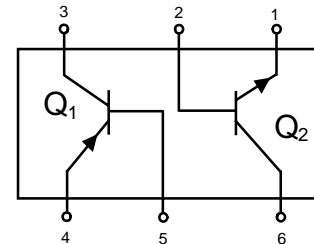
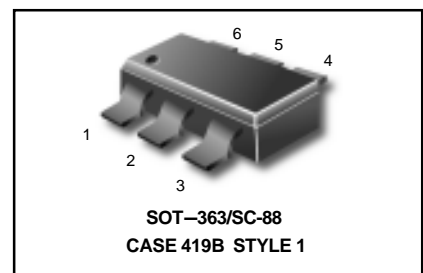
S- Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable.

### ORDERING INFORMATION

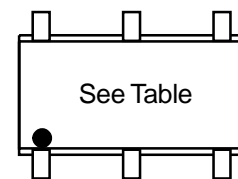
Device	Marking	Shipping
LBC846BPDW1T1G	S-LBC846BPDW1T1G BB	3000 Units/Reel
LBC846BPDW1T3G	S-LBC846BPDW1T3G BB	10000 Units/Reel
LBC847BPDW1T1G	S-LBC847BPDW1T1G BF	3000 Units/Reel
LBC847BPDW1T3G	S-LBC847BPDW1T3G BF	10000 Units/Reel
LBC847CPDW1T1G	S-LBC847CPDW1T1G BG	3000 Units/Reel
LBC847CPDW1T3G	S-LBC847CPDW1T3G BG	10000 Units/Reel
LBC848BPDW1T1G	S-LBC848BPDW1T1G BK	3000 Units/Reel
LBC848BPDW1T3G	S-LBC848BPDW1T3G BK	10000 Units/Reel
LBC848CPDW1T1G	S-LBC848CPDW1T1G BL	3000 Units/Reel
LBC848CPDW1T3G	S-LBC848CPDW1T3G BL	10000 Units/Reel

LBC846BPDW1T1G  
LBC847BPDW1T1G  
LBC847CPDW1T1G  
LBC848BPDW1T1G  
LBC848CPDW1T1G

S-LBC846BPDW1T1G  
S-LBC847BPDW1T1G  
S-LBC847CPDW1T1G  
S-LBC848BPDW1T1G  
S-LBC848CPDW1T1G



DEVICE MARKING



### MAXIMUM RATINGS – NPN

Rating	Symbol	LBC846	LBC847	LBC848	Unit
Collector–Emitter Voltage	$V_{CEO}$	65	45	30	V
Collector–Base Voltage	$V_{CBO}$	80	50	30	V
Emitter–Base Voltage	$V_{EBO}$	6.0	6.0	5.0	V
Collector Current $I_C$ Continuous	$I_C$	100	100	100	mAdc

### MAXIMUM RATINGS – PNP

Rating	Symbol	LBC846	LBC847	LBC848	Unit
Collector–Emitter Voltage	$V_{CEO}$	-65	-45	-30	V
Collector–Base Voltage	$V_{CBO}$	-80	-50	-30	V
Emitter–Base Voltage	$V_{EBO}$	-5.0	-5.0	-5.0	V
Collector Current $I_C$ Continuous	$I_C$	-100	-100	-100	mAdc

### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation Per Device FR-5 Board (1) $T_A = 25^\circ\text{C}$ Derate Above $25^\circ\text{C}$	$P_D$	380 250	mW
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	328	$^\circ\text{C/W}$
Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

1. FR-5 = 1.0 x 0.75 x 0.062 in

**LBC846BPDW1T1G LBC847BPDW1T1G Series, LBC848BPDW1T1G Series**  
**S-LBC846BPDW1T1G S-LBC847BPDW1T1G Series, S-LBC848BPDW1T1G Series**

**ELECTRICAL CHARACTERISTICS (NPN)** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector–Emitter Breakdown Voltage ( $I_C = 10\text{ mA}$ )	$V_{(BR)CEO}$	65 45 30	—	—	V
		LBC846 Series LBC847 Series LBC848 Series			
Collector–Emitter Breakdown Voltage ( $I_C = 10\ \mu\text{A}$ , $V_{EB} = 0$ )	$V_{(BR)CES}$	80 50 30	—	—	V
		LBC846 Series LBC847B Only LBC848 Series			
Collector–Base Breakdown Voltage ( $I_C = 10\ \mu\text{A}$ )	$V_{(BR)CBO}$	80 50 30	—	—	V
		LBC846 Series LBC847 Series LBC848 Series			
Emitter–Base Breakdown Voltage ( $I_E = 1.0\ \mu\text{A}$ )	$V_{(BR)EBO}$	6.0 6.0 5.0	—	—	V
		LBC846 Series LBC847 Series LBC848 Series			
Collector Cutoff Current ( $V_{CB} = 30\text{ V}$ ) ( $V_{CB} = 30\text{ V}$ , $T_A = 150^\circ\text{C}$ )	$I_{CBO}$	— —	— —	15 5.0	nA $\mu\text{A}$

**ON CHARACTERISTICS**

DC Current Gain  ( $I_C = 2.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ )	$h_{FE}$	200 420	290 520	475 800	—
		LBC846B, LBC847B, LBC848B LBC847C, LBC848C			
Collector–Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 0.5\text{ mA}$ ) ( $I_C = 100\text{ mA}$ , $I_B = 5.0\text{ mA}$ )	$V_{CE(sat)}$	— —	— —	0.25 0.6	V
Base–Emitter Saturation Voltage ( $I_C = 10\text{ mA}$ , $I_B = 0.5\text{ mA}$ ) ( $I_C = 100\text{ mA}$ , $I_B = 5.0\text{ mA}$ )	$V_{BE(sat)}$	— —	0.7 0.9	— —	V
Base–Emitter Voltage ( $I_C = 2.0\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ ) ( $I_C = 10\text{ mA}$ , $V_{CE} = 5.0\text{ V}$ )	$V_{BE(on)}$	580 —	660 —	700 770	mV

**SMALL–SIGNAL CHARACTERISTICS**

Current–Gain — Bandwidth Product ( $I_C = 10\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ , $f = 100\text{ MHz}$ )	$f_T$	100	—	—	MHz
Output Capacitance ( $V_{CB} = 10\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{obo}$	—	—	4.5	pF
Noise Figure ( $I_C = 0.2\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ , $R_S = 2.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ , $BW = 200\text{ Hz}$ )	NF	—	—	10	dB

**LBC846BPDW1T1G LBC847BPDW1T1G Series, LBC848BPDW1T1G Series**  
**S-LBC846BPDW1T1G S-LBC847BPDW1T1G Series, S-LBC848BPDW1T1G Series**

**ELECTRICAL CHARACTERISTICS (PNP)** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Collector–Emitter Breakdown Voltage ( $I_C = -10\text{ mA}$ ) LBC846 Series LBC847 Series LBC848 Series	$V_{(BR)CEO}$	-65 -45 -30	—	—	V
Collector–Emitter Breakdown Voltage ( $I_C = -10\ \mu\text{A}$ , $V_{EB} = 0$ ) LBC846 Series LBC847 Series LBC848 Series	$V_{(BR)CES}$	-80 -50 -30	—	—	V
Collector–Base Breakdown Voltage ( $I_C = -10\ \mu\text{A}$ ) LBC846 Series LBC847 Series LBC848 Series	$V_{(BR)CBO}$	-80 -50 -30	—	—	V
Emitter–Base Breakdown Voltage ( $I_E = -1.0\ \mu\text{A}$ ) LBC846 Series LBC847 Series LBC848 Series	$V_{(BR)EBO}$	-5.0 -5.0 -5.0	—	—	V
Collector Cutoff Current ( $V_{CB} = -30\text{ V}$ ) ( $V_{CB} = -30\text{ V}$ , $T_A = 150^\circ\text{C}$ )	$I_{CBO}$	— —	—	-15 -4.0	nA $\mu\text{A}$

**ON CHARACTERISTICS**

DC Current Gain ( $I_C = -10\ \mu\text{A}$ , $V_{CE} = -5.0\text{ V}$ ) LBC846B, LBC847B, LBC848B LBC847C, LBC848C  ( $I_C = -2.0\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ ) LBC846B, LBC847B, LBC848B LBC847C, LBC848C	$h_{FE}$	— — 200 420	150 270 290 520	— — 475 800	—
Collector–Emitter Saturation Voltage ( $I_C = -10\text{ mA}$ , $I_B = -0.5\text{ mA}$ ) ( $I_C = -100\text{ mA}$ , $I_B = -5.0\text{ mA}$ )	$V_{CE(sat)}$	— —	—	-0.3 -0.65	V
Base–Emitter Saturation Voltage ( $I_C = -10\text{ mA}$ , $I_B = -0.5\text{ mA}$ ) ( $I_C = -100\text{ mA}$ , $I_B = -5.0\text{ mA}$ )	$V_{BE(sat)}$	— —	-0.7 -0.9	—	V
Base–Emitter On Voltage ( $I_C = -2.0\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ ) ( $I_C = -10\text{ mA}$ , $V_{CE} = -5.0\text{ V}$ )	$V_{BE(on)}$	-0.6 —	—	-0.75 -0.82	V

**SMALL–SIGNAL CHARACTERISTICS**

Current–Gain — Bandwidth Product ( $I_C = -10\text{ mA}$ , $V_{CE} = -5.0\text{ Vdc}$ , $f = 100\text{ MHz}$ )	$f_T$	100	—	—	MHz
Output Capacitance ( $V_{CB} = -10\text{ V}$ , $f = 1.0\text{ MHz}$ )	$C_{ob}$	—	—	4.5	pF
Noise Figure ( $I_C = -0.2\text{ mA}$ , $V_{CE} = -5.0\text{ Vdc}$ , $R_S = 2.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ , $BW = 200\text{ Hz}$ )	NF	—	—	10	dB

LBC846BPDW1T1G LBC847BPDW1T1G Series, LBC848BPDW1T1G Series  
 S-LBC846BPDW1T1G S-LBC847BPDW1T1G Series, S-LBC848BPDW1T1G Series

TYPICAL NPN CHARACTERISTICS – LBC846

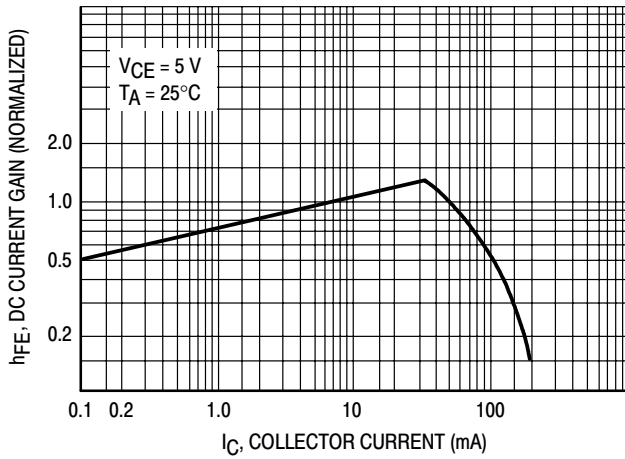


Figure 1. DC Current Gain

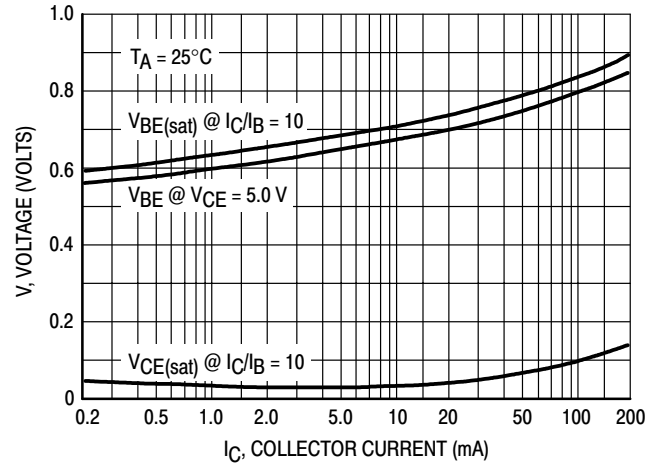


Figure 2. "On" Voltage

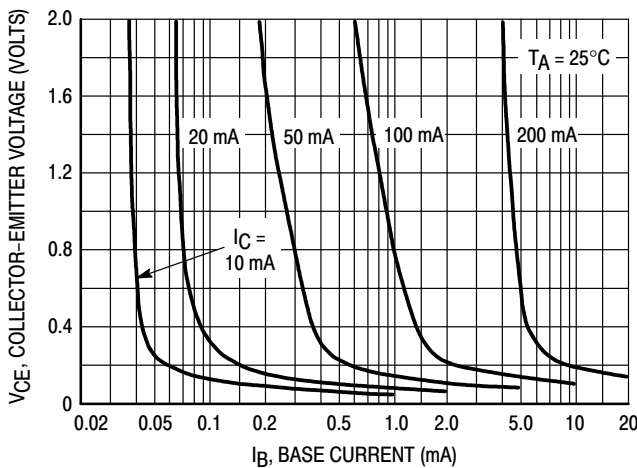


Figure 3. Collector Saturation Region

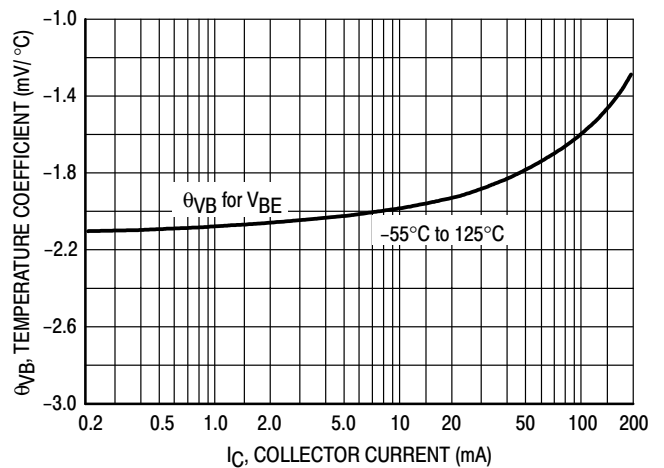


Figure 4. Base-Emitter Temperature Coefficient

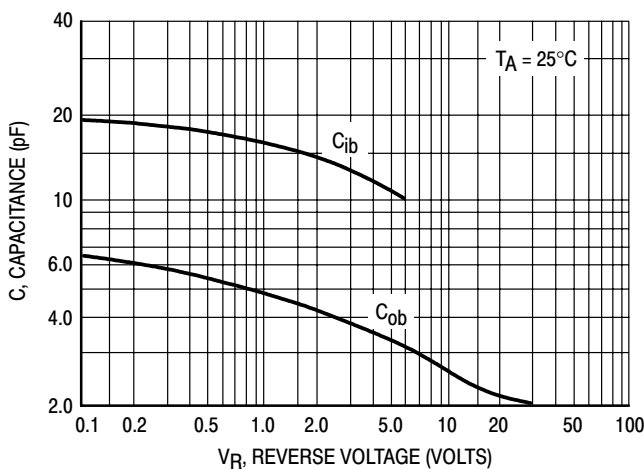


Figure 5. Capacitance

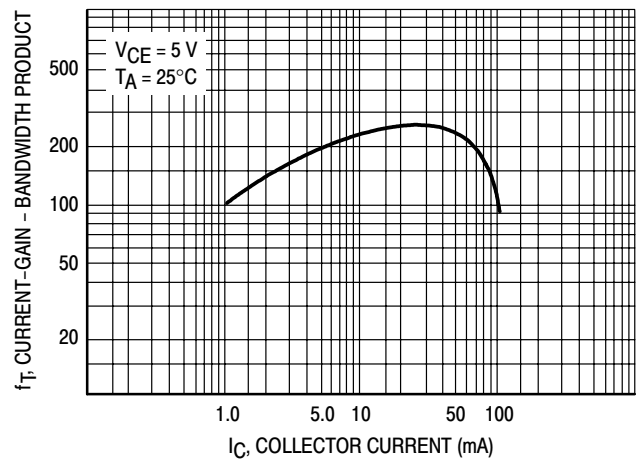


Figure 6. Current-Gain - Bandwidth Product

LBC846BPDW1T1G LBC847BPDW1T1G Series, LBC848BPDW1T1G Series  
 S-LBC846BPDW1T1G S-LBC847BPDW1T1G Series, S-LBC848BPDW1T1G Series

TYPICAL PNP CHARACTERISTICS — LBC846

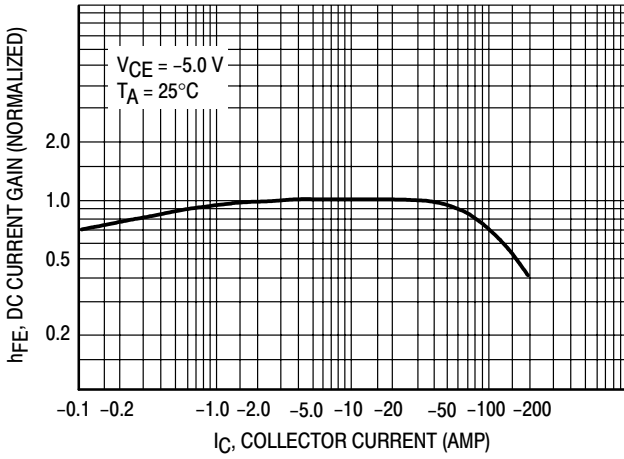


Figure 7. DC Current Gain

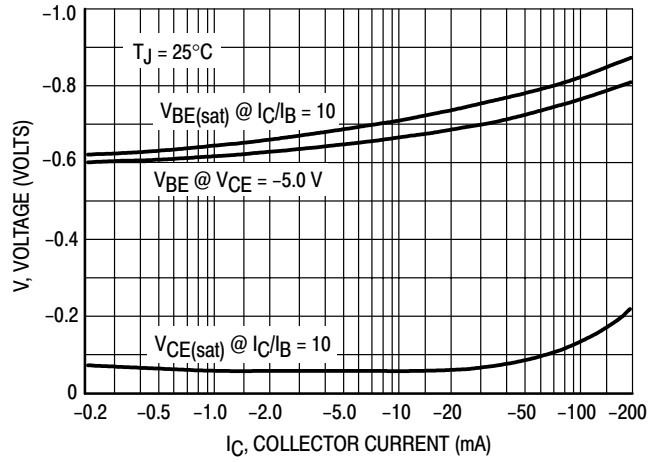


Figure 8. "On" Voltage

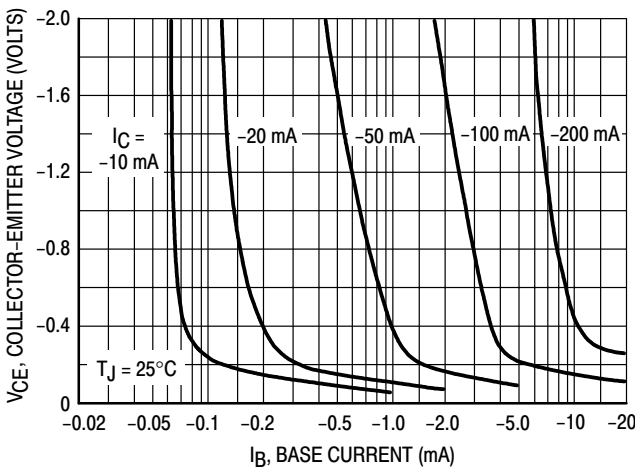


Figure 9. Collector Saturation Region

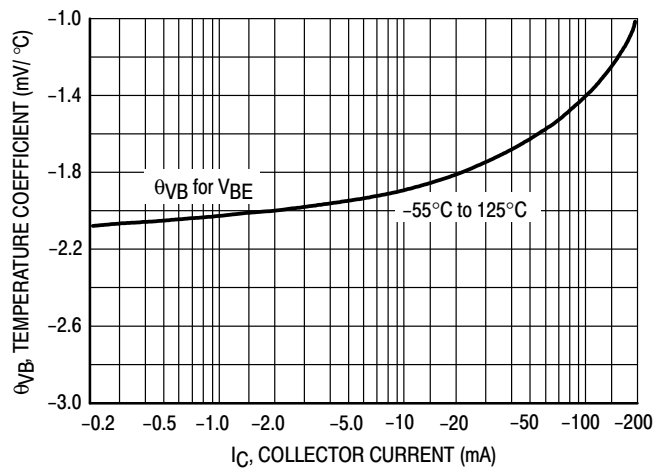


Figure 10. Base-Emitter Temperature Coefficient

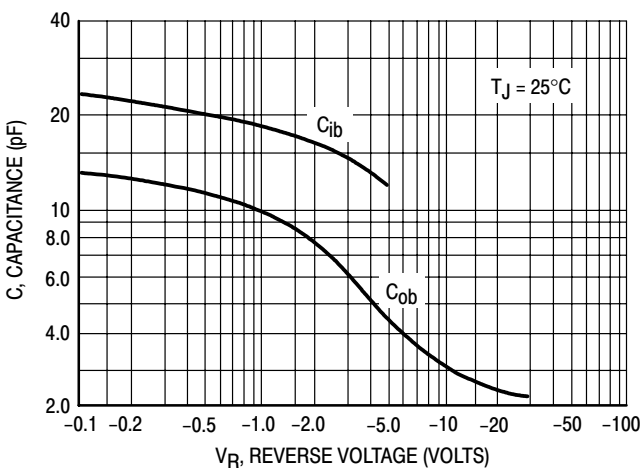


Figure 11. Capacitance

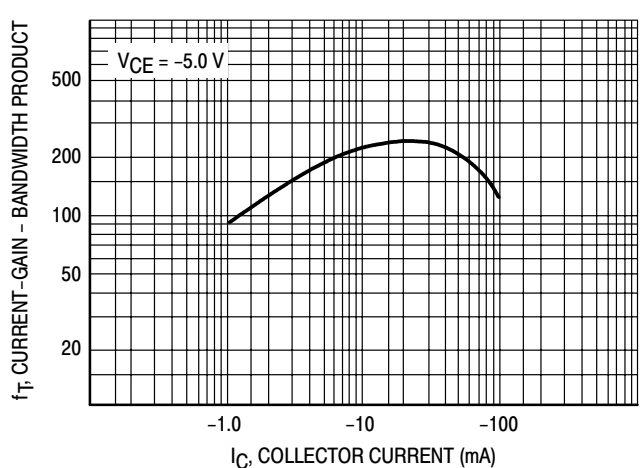


Figure 12. Current-Gain - Bandwidth Product

LBC846BPDW1T1G LBC847BPDW1T1G Series, LBC848BPDW1T1G Series  
 S-LBC846BPDW1T1G S-LBC847BPDW1T1G Series, S-LBC848BPDW1T1G Series

TYPICAL NPN CHARACTERISTICS – LBC847 SERIES & LBC848 SERIES

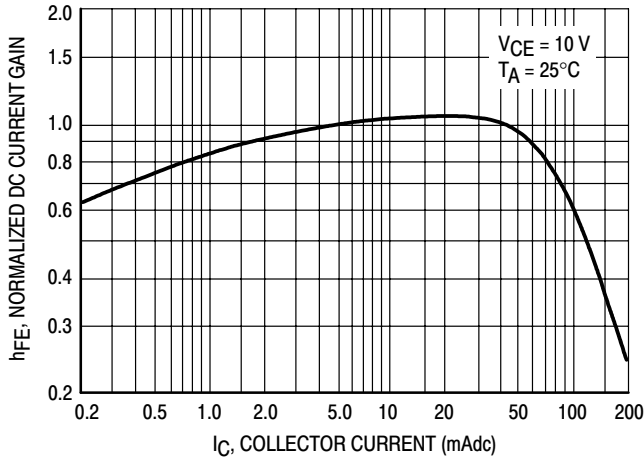


Figure 13. Normalized DC Current Gain

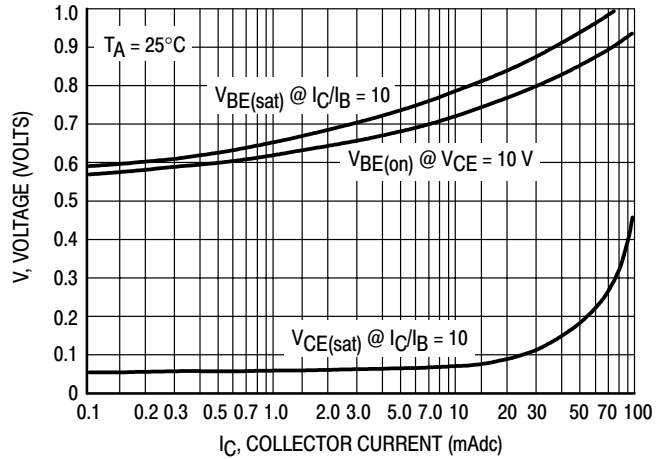


Figure 14. "Saturation" and "On" Voltages

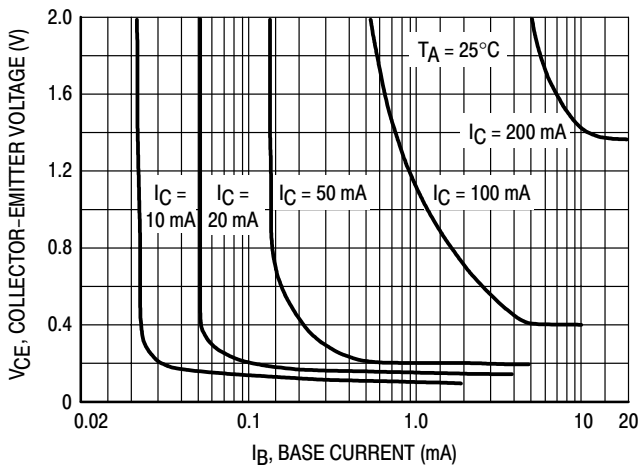


Figure 15. Collector Saturation Region

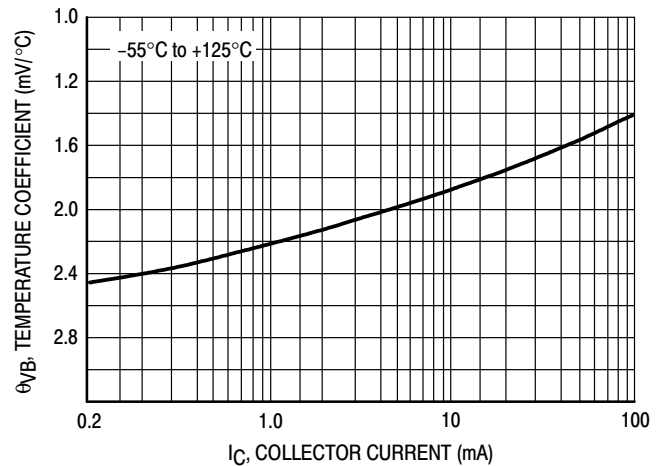


Figure 16. Base-Emitter Temperature Coefficient

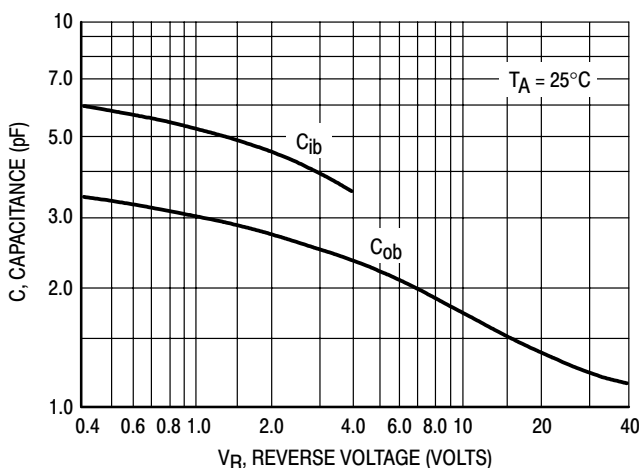


Figure 17. Capacitances

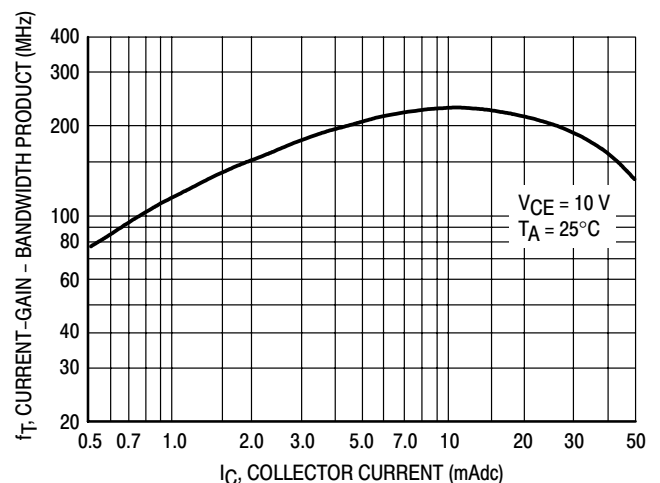


Figure 18. Current-Gain - Bandwidth Product

LBC846BPDW1T1G LBC847BPDW1T1G Series, LBC848BPDW1T1G Series  
 S-LBC846BPDW1T1G S-LBC847BPDW1T1G Series, S-LBC848BPDW1T1G Series

TYPICAL PNP CHARACTERISTICS — LBC847 SERIES & LBC848 SERIES

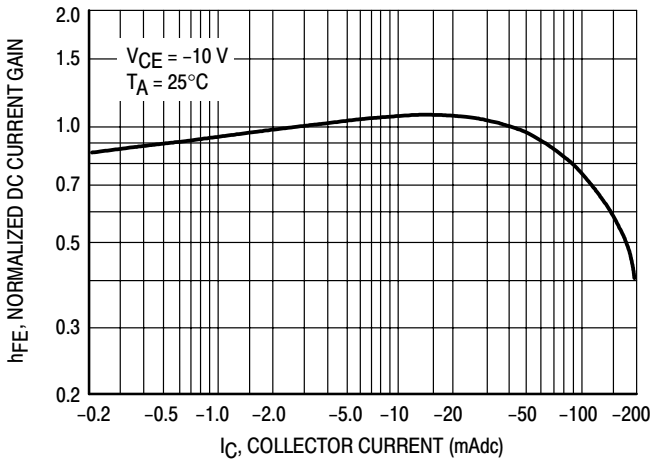


Figure 19. Normalized DC Current Gain

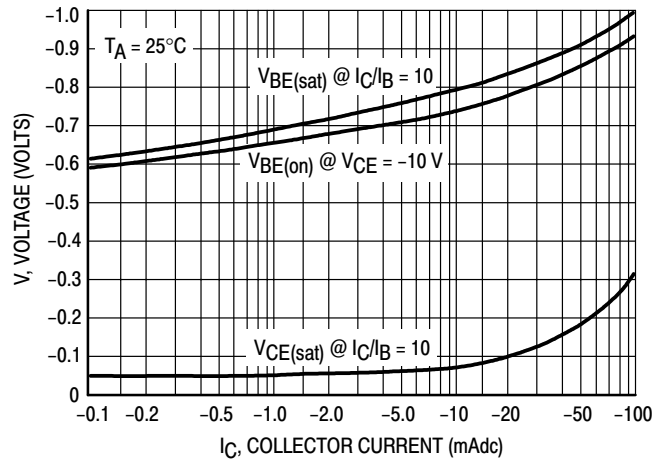


Figure 20. "Saturation" and "On" Voltages

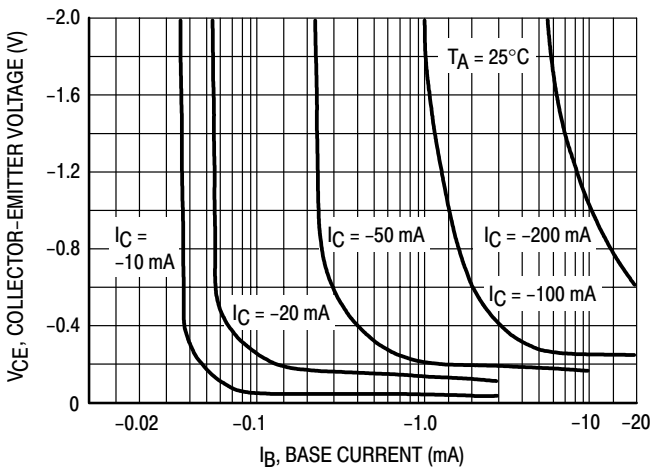


Figure 21. Collector Saturation Region

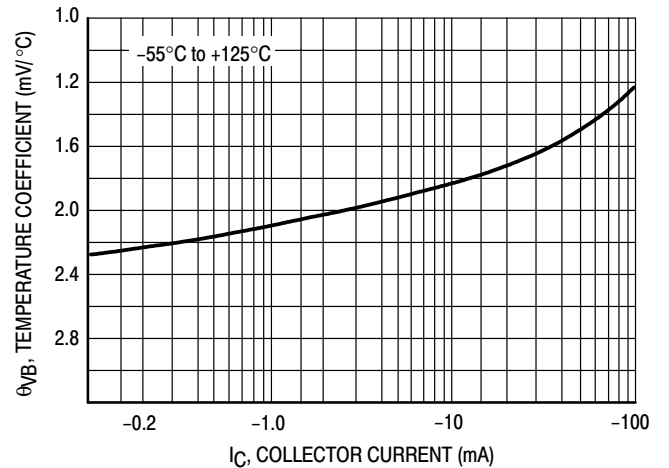


Figure 22. Base-Emitter Temperature Coefficient

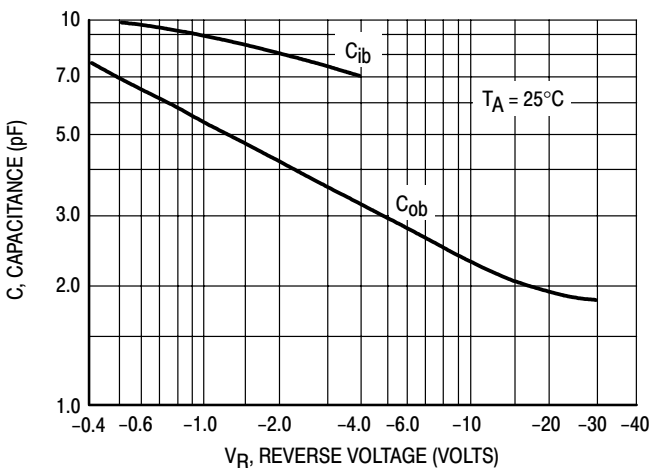


Figure 23. Capacitances

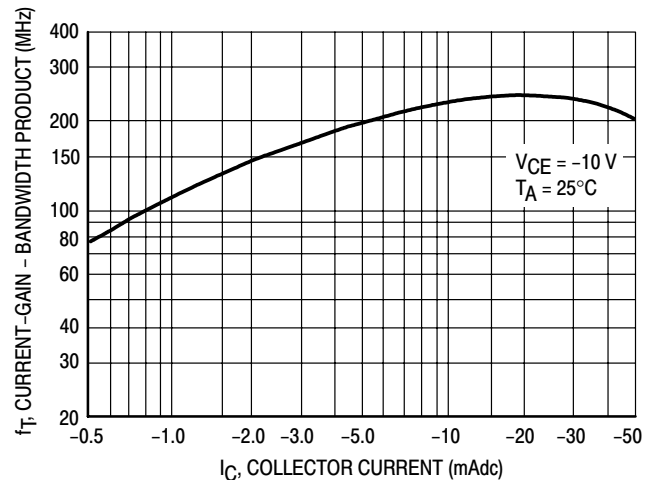


Figure 24. Current-Gain - Bandwidth Product

LBC846BPDW1T1G LBC847BPDW1T1G Series, LBC848BPDW1T1G Series  
 S-LBC846BPDW1T1G S-LBC847BPDW1T1G Series, S-LBC848BPDW1T1G Series

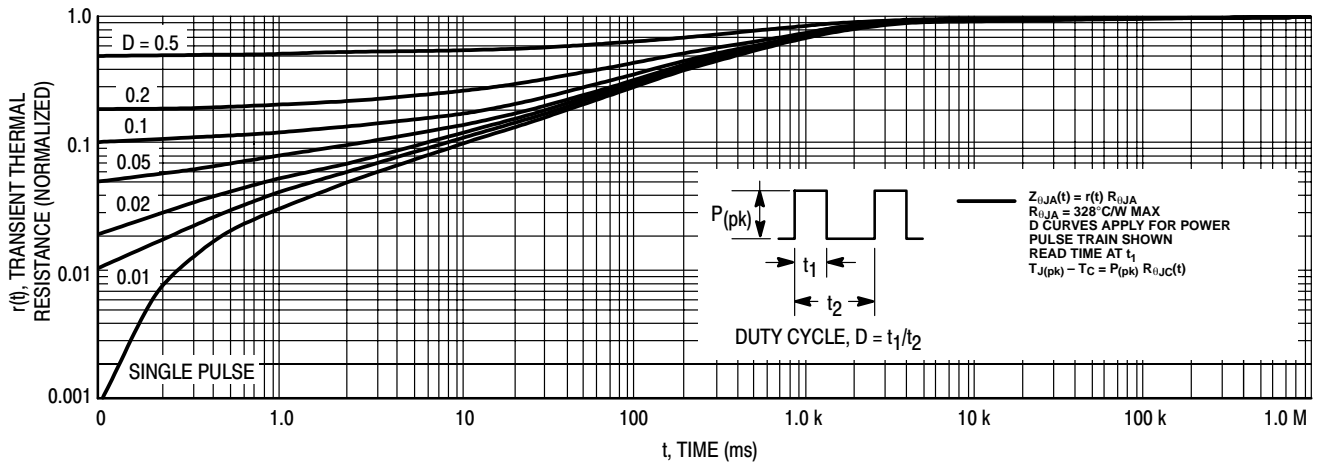
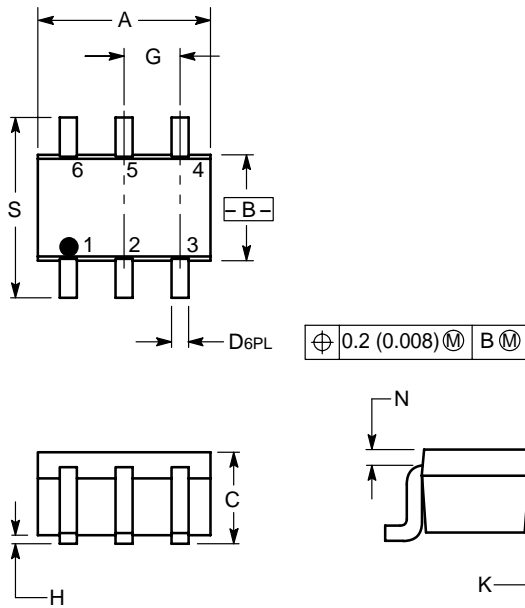


Figure 25. Thermal Response



LBC846BPDW1T1G LBC847BPDW1T1G Series, LBC848BPDW1T1G Series  
 S-LBC846BPDW1T1G S-LBC847BPDW1T1G Series, S-LBC848BPDW1T1G Series

SC-88/SOT-363

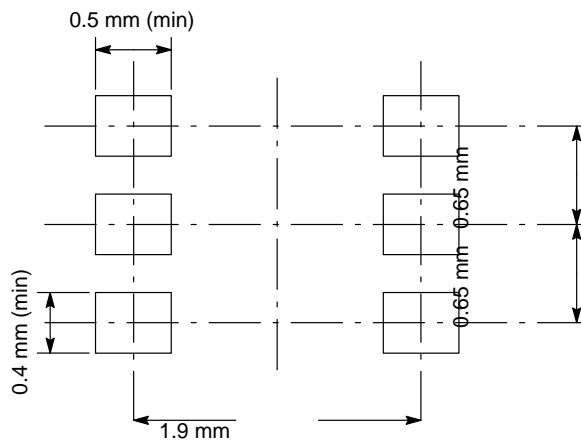


NOTES:

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



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[NTE195A](#) [NTE92](#) [C4460](#) [2N4401-A](#) [2N6728](#) [2SA1419T-TD-H](#) [2SA2126-E](#) [2SB1204S-TL-E](#) [2SC2712S-GR,LF](#) [2SC5488A-TL-H](#)  
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