

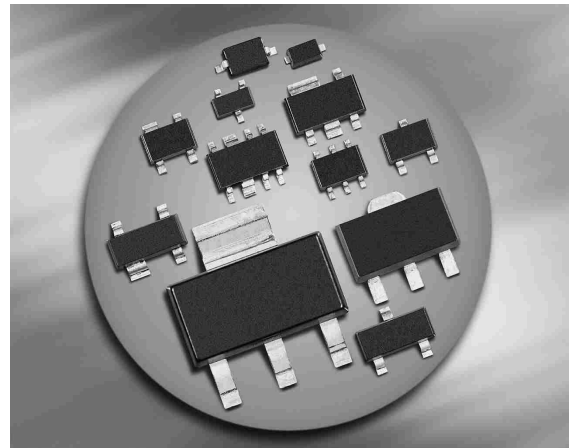


**THE DATASHEET OF
BC847CE6433HTMA1**



NPN Silicon AF Transistors

- For AF input stages and driver applications
- High current gain
- Low collector-emitter saturation voltage
- Low noise between 30 Hz and 15 kHz
- Complementary types:
BC856...-BC860...(PNP)
- Pb-free (RoHS compliant) package ¹⁾
- Qualified according AEC Q101



¹Pb-containing package may be available upon special request

Type	Marking	Pin Configuration						Package
		1=B	2=E	3=C	-	-	-	
BC846A	1As	1=B	2=E	3=C	-	-	-	SOT23
BC846B	1Bs	1=B	2=E	3=C	-	-	-	SOT23
BC846BW	1Bs	1=B	2=E	3=C	-	-	-	SOT323
BC847A	1Es	1=B	2=E	3=C	-	-	-	SOT23
BC847B	1Fs	1=B	2=E	3=C	-	-	-	SOT23
BC847BF*	1Fs	1=B	2=E	3=C	-	-	-	TSFP-3
BC847BL3	1F	1=B	2=E	3=C	-	-	-	TSLP-3-1
BC847BW	1Fs	1=B	2=E	3=C	-	-	-	SOT323
BC847C	1Gs	1=B	2=E	3=C	-	-	-	SOT23
BC847CW	1Gs	1=B	2=E	3=C	-	-	-	SOT323
BC848A	1Js	1=B	2=E	3=C	-	-	-	SOT23
BC848B	1Ks	1=B	2=E	3=C	-	-	-	SOT23
BC848BL3	1K	1=B	2=E	3=C	-	-	-	TSLP-3-1
BC848BW	1Ks	1=B	2=E	3=C	-	-	-	SOT323
BC848C	1Ls	1=B	2=E	3=C	-	-	-	SOT23
BC848CW	1Ls	1=B	2=E	3=C	-	-	-	SOT323
BC849B	2Bs	1=B	2=E	3=C	-	-	-	SOT23
BC849C	2Cs	1=B	2=E	3=C	-	-	-	SOT23
BC849CW	2Cs	1=B	2=E	3=C	-	-	-	SOT323
BC850B	2Fs	1=B	2=E	3=C	-	-	-	SOT23
BC850BW	2Fs	1=B	2=E	3=C	-	-	-	SOT323
BC850C	2Gs	1=B	2=E	3=C	-	-	-	SOT23
BC850CW	2Gs	1=B	2=E	3=C	-	-	-	SOT323

* Not for new design

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage BC846... BC847..., BC850... BC848..., BC849...	V_{CEO}	65 45 30	V
Collector-emitter voltage BC846... BC847..., BC850... BC848..., BC849...	V_{CES}	80 50 30	
Collector-base voltage BC846... BC847..., BC850... BC848..., BC849...	V_{CBO}	80 50 30	
Emitter-base voltage BC846... BC847..., BC850... BC848..., BC849...	V_{EBO}	6 6 6	
Collector current	I_C	100	mA
Peak collector current, $t_p \leq 10$ ms	I_{CM}	200	
Total power dissipation- $T_S \leq 71$ °C, BC846-BC850 $T_S \leq 128$ °C, BC847F $T_S \leq 135$ °C, BC847L3-BC848L3 $T_S \leq 124$ °C, BC846W-BC850W	P_{tot}	330 250 250 250	mW
Junction temperature	T_j	150	
Storage temperature	T_{stg}	-65 ... 150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point ¹⁾ BC846-BC850 BC847F BC847L3-BC848L3 BC846W-BC850W	R_{thJS}	≤ 240 ≤ 90 ≤ 60 ≤ 105	K/W

¹⁾For calculation of R_{thJA} please refer to Application Note Thermal Resistance

Electrical Characteristics at $T_A = 25^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage $I_C = 10\text{ mA}$, $I_B = 0$, BC846... $I_C = 10\text{ mA}$, $I_B = 0$, BC847..., BC850... $I_C = 10\text{ mA}$, $I_B = 0$, BC848..., BC849...	$V_{(BR)CEO}$	65 45 30	- - -	- - -	V
Collector-base breakdown voltage $I_C = 10\text{ }\mu\text{A}$, $I_E = 0$, BC846... $I_C = 10\text{ }\mu\text{A}$, $I_E = 0$, BC847..., BC850... $I_C = 10\text{ }\mu\text{A}$, $I_E = 0$, BC848..., BC849...	$V_{(BR)CBO}$	80 50 30	- - -	- - -	
Emitter-base breakdown voltage $I_E = 0$, $I_C = 10\text{ }\mu\text{A}$	$V_{(BR)EBO}$	-	6	-	
Collector-base cutoff current $V_{CB} = 45\text{ V}$, $I_E = 0$ $V_{CB} = 30\text{ V}$, $I_E = 0$, $T_A = 150^\circ\text{C}$	I_{CBO}	- -	0.015 5	- -	μA
DC current gain ¹⁾ $I_C = 10\text{ }\mu\text{A}$, $V_{CE} = 5\text{ V}$, h_{FE} -grp.A $I_C = 10\text{ }\mu\text{A}$, $V_{CE} = 5\text{ V}$, h_{FE} -grp.B $I_C = 10\text{ }\mu\text{A}$, $V_{CE} = 5\text{ V}$, h_{FE} -grp.C $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$, h_{FE} -grp.A $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$, h_{FE} -grp.B $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$, h_{FE} -grp.C	h_{FE}	- - - 110 200 420	140 250 480 180 290 520	- - - 220 450 800	-
Collector-emitter saturation voltage ¹⁾ $I_C = 10\text{ mA}$, $I_B = 0.5\text{ mA}$ $I_C = 100\text{ mA}$, $I_B = 5\text{ mA}$	V_{CEsat}	- -	90 200	250 600	mV
Base emitter saturation voltage ¹⁾ $I_C = 10\text{ mA}$, $I_B = 0.5\text{ mA}$ $I_C = 100\text{ mA}$, $I_B = 5\text{ mA}$	V_{BEsat}	- -	700 900	- -	
Base-emitter voltage ¹⁾ $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$ $I_C = 10\text{ mA}$, $V_{CE} = 5\text{ V}$	$V_{BE(ON)}$	580 -	660 -	700 770	

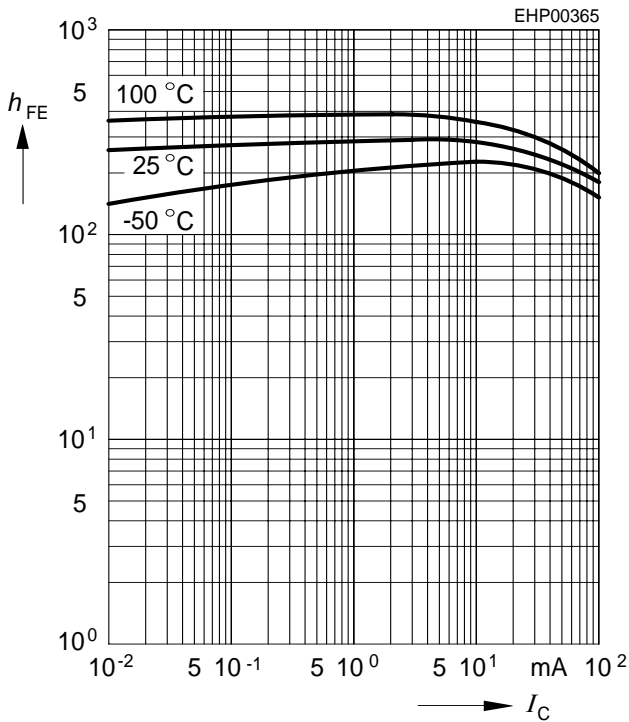
¹⁾Pulse test: $t < 300\mu\text{s}$; $D < 2\%$

Electrical Characteristics at $T_A = 25^\circ\text{C}$, unless otherwise specified

Parameter	Symbol	Values			Unit	
		min.	typ.	max.		
AC Characteristics						
Transition frequency $I_C = 10\text{ mA}$, $V_{CE} = 5\text{ V}$, $f = 100\text{ MHz}$	f_T	-	250	-	MHz	
Collector-base capacitance $V_{CB} = 10\text{ V}$, $f = 1\text{ MHz}$	C_{cb}	-	0.95	-	pF	
Emitter-base capacitance $V_{EB} = 0.5\text{ V}$, $f = 1\text{ MHz}$	C_{eb}	-	9	-		
Short-circuit input impedance $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$, $f = 1\text{ kHz}$, $h_{FE}\text{-grp.A}$ $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$, $f = 1\text{ kHz}$, $h_{FE}\text{-grp.B}$ $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$, $f = 1\text{ kHz}$, $h_{FE}\text{-grp.C}$	h_{11e}	-	2.7 4.5 8.7	-	k Ω	
Open-circuit reverse voltage transf. ratio $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$, $f = 1\text{ kHz}$, $h_{FE}\text{-grp.A}$ $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$, $f = 1\text{ kHz}$, $h_{FE}\text{-grp.B}$ $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$, $f = 1\text{ kHz}$, $h_{FE}\text{-grp.C}$	h_{12e}	-	1.5 2 3	-		10^{-4}
Short-circuit forward current transf. ratio $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$, $f = 1\text{ kHz}$, $h_{FE}\text{-grp.A}$ $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$, $f = 1\text{ kHz}$, $h_{FE}\text{-grp.B}$ $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$, $f = 1\text{ kHz}$, $h_{FE}\text{-grp.C}$	h_{21e}	-	200 330 600	-		
Open-circuit output admittance $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$, $f = 1\text{ kHz}$, $h_{FE}\text{-grp.A}$ $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$, $f = 1\text{ kHz}$, $h_{FE}\text{-grp.B}$ $I_C = 2\text{ mA}$, $V_{CE} = 5\text{ V}$, $f = 1\text{ kHz}$, $h_{FE}\text{-grp.C}$	h_{22e}	-	18 30 60	-	μS	
Noise figure $I_C = 200\text{ }\mu\text{A}$, $V_{CE} = 5\text{ V}$, $f = 1\text{ kHz}$, $\Delta f = 200\text{ Hz}$, $R_S = 2\text{ k}\Omega$, BC849..., BC850...	F	-	1.2	4	dB	
Equivalent noise voltage $I_C = 200\text{ }\mu\text{A}$, $V_{CE} = 5\text{ V}$, $R_S = 2\text{ k}\Omega$, $f = 10 \dots 50\text{ Hz}$, BC850...	V_n	-	-	0.135	μV	

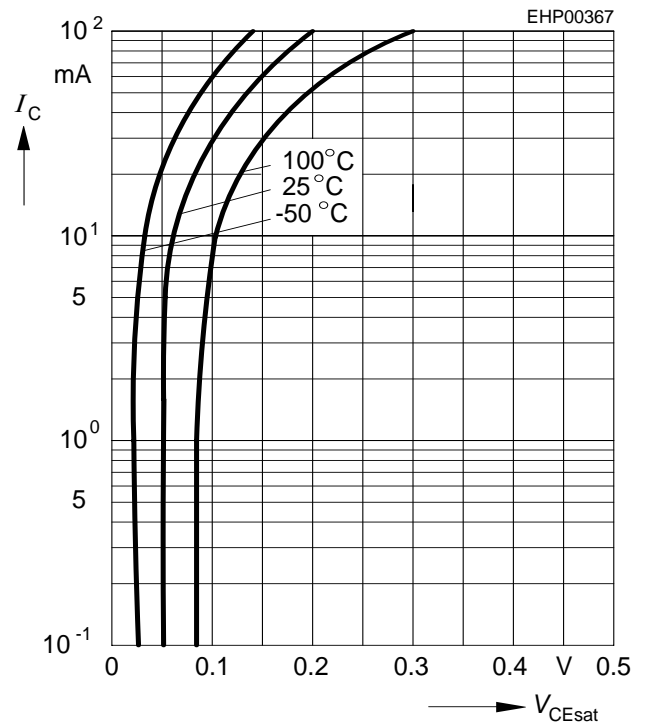
DC current gain $h_{FE} = f(I_C)$

$V_{CE} = 5\text{ V}$



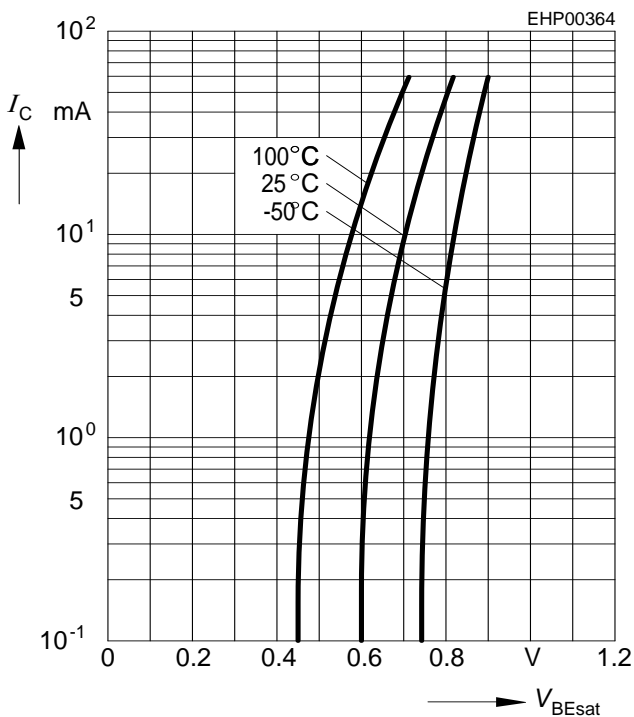
Collector-emitter saturation voltage

$I_C = f(V_{CEsat}), h_{FE} = 20$



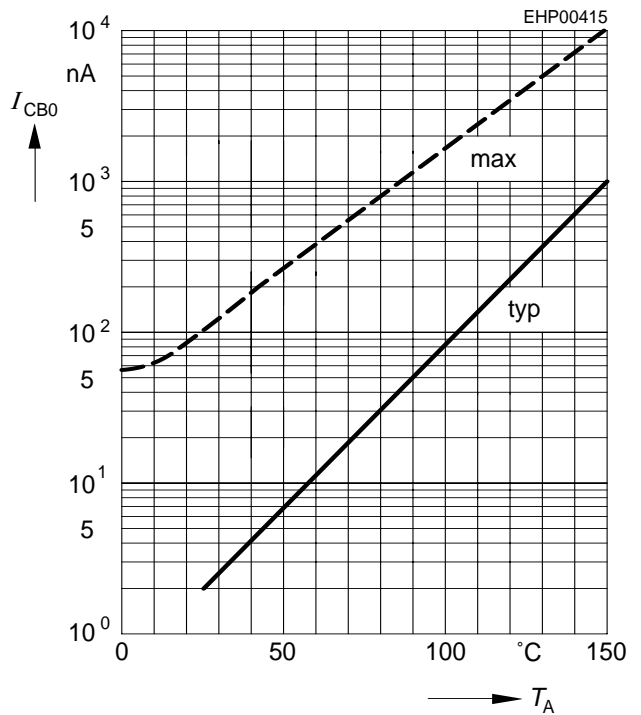
Base-emitter saturation voltage

$I_C = f(V_{BEsat}), h_{FE} = 20$



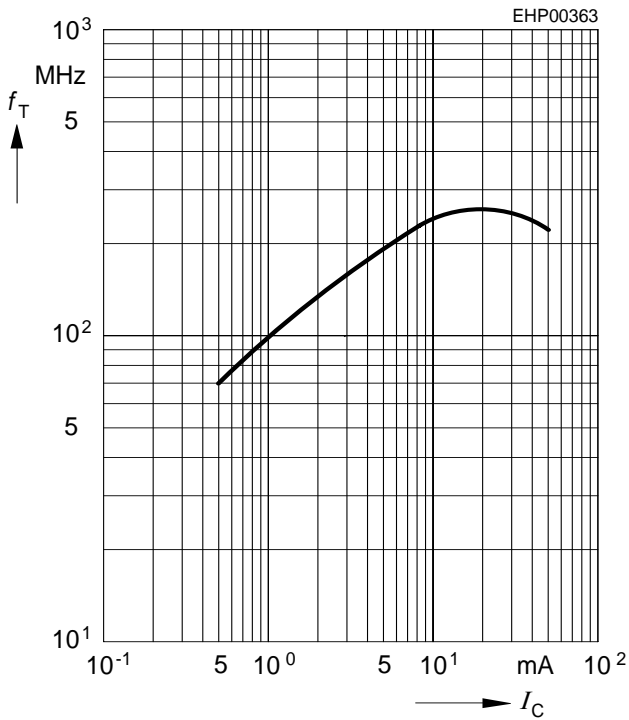
Collector cutoff current $I_{CBO} = f(T_A)$

$V_{CB} = 30\text{ V}$



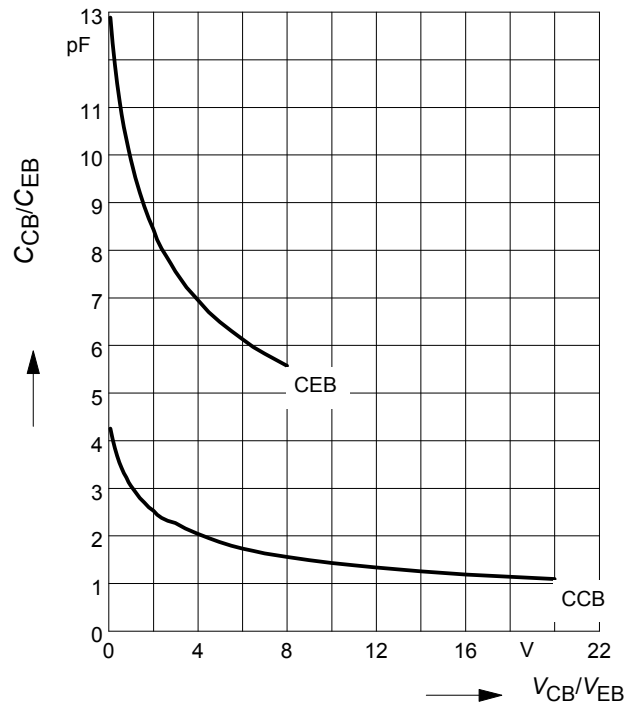
Transition frequency $f_T = f(I_C)$

$V_{CE} = 5\text{ V}$



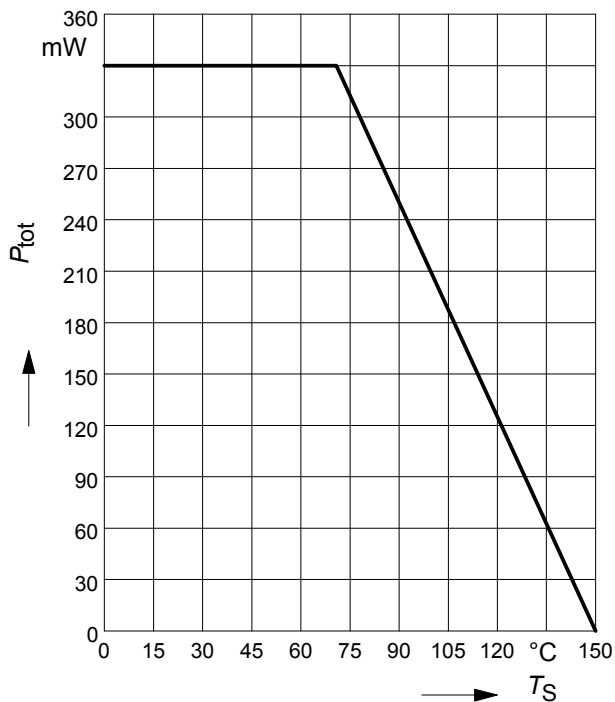
Collector-base capacitance $C_{cb} = f(V_{CB})$

Emitter-base capacitance $C_{eb} = f(V_{EB})$



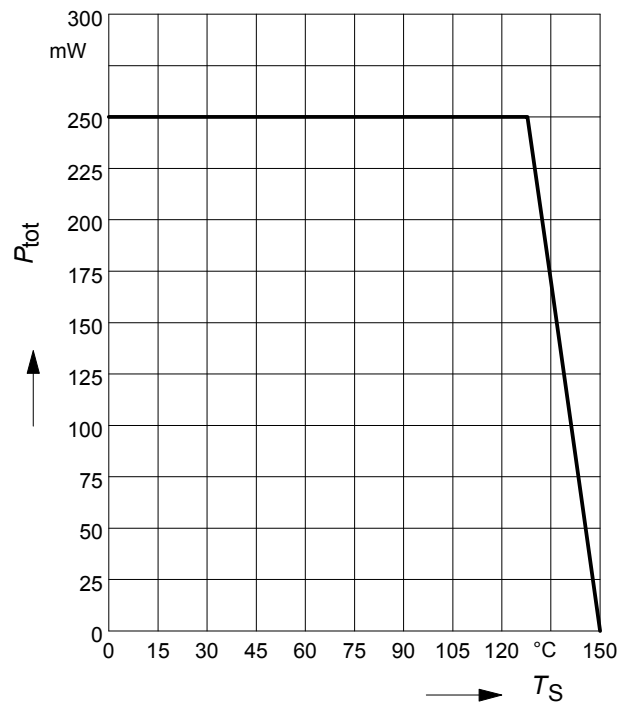
Total power dissipation $P_{tot} = f(T_S)$

BC846-BC850



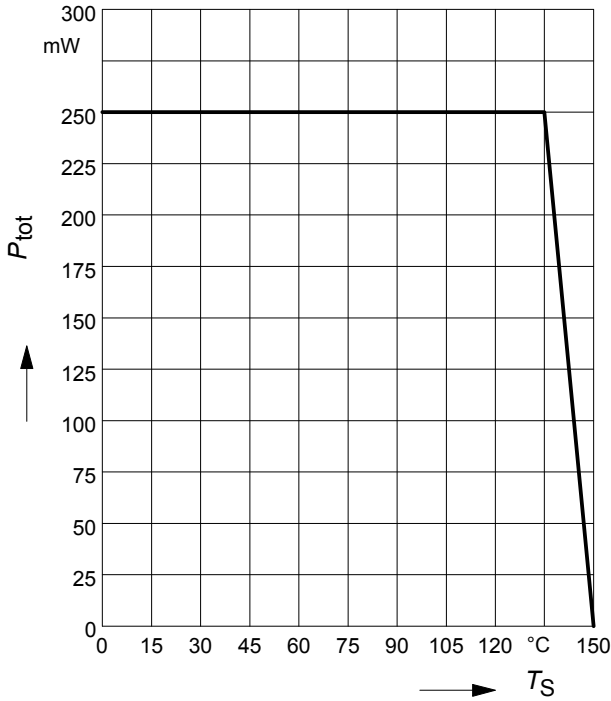
Total power dissipation $P_{tot} = f(T_S)$

BC847BF



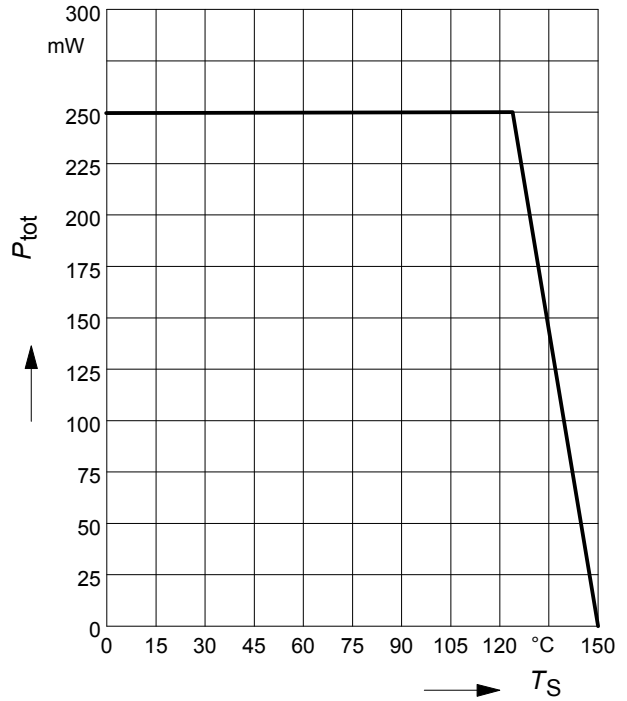
Total power dissipation $P_{tot} = f(T_S)$

BC847BL3/BC848BL3



Total power dissipation $P_{tot} = f(T_S)$

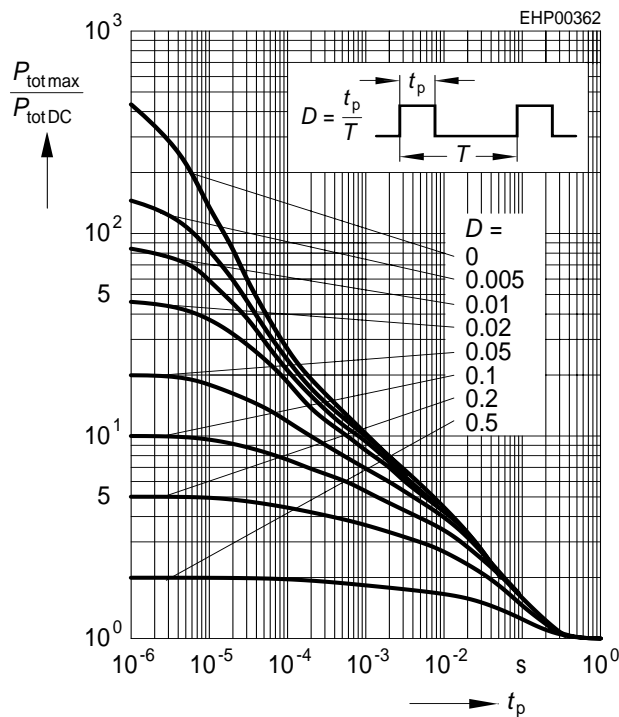
BC846W-BC850W



Permissible Pulse Load

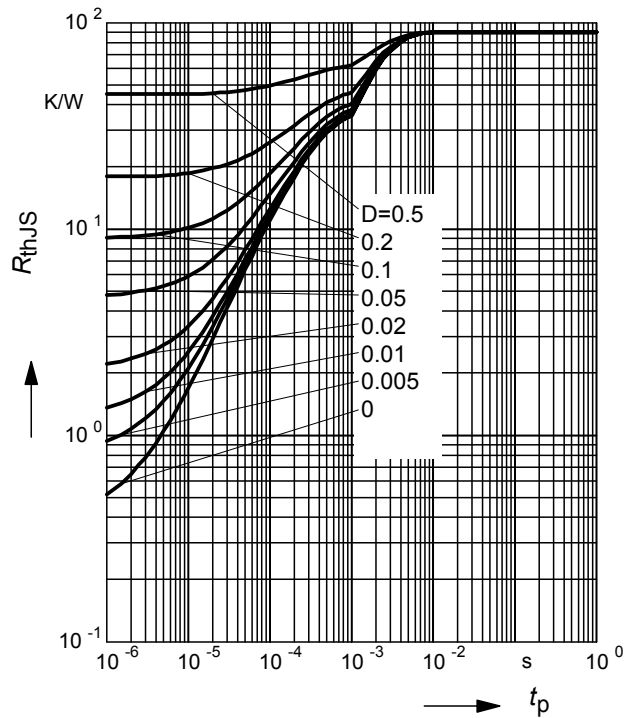
$P_{totmax}/P_{totDC} = f(t_p)$

BC846/W-BC850/W



Permissible Puls Load $R_{thJS} = f(t_p)$

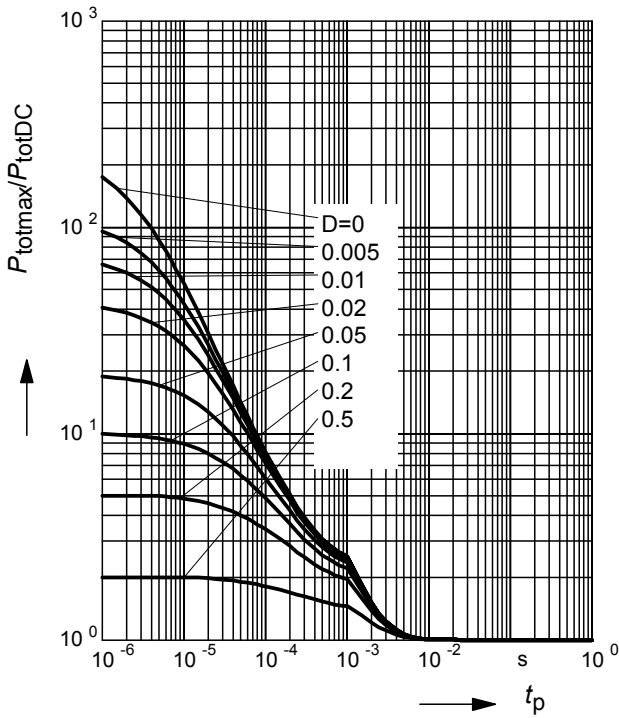
BC847BF



Permissible Pulse Load

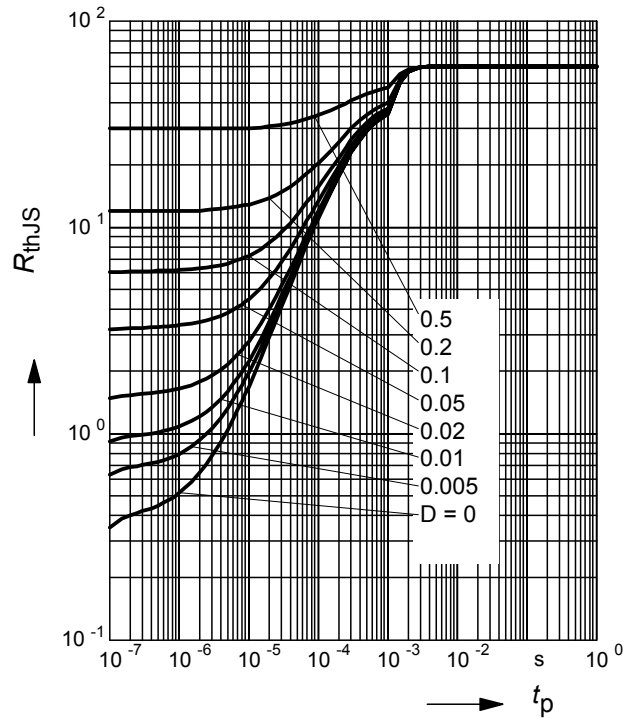
$$P_{\text{totmax}}/P_{\text{totDC}} = f(t_p)$$

BC847BF



Permissible Puls Load $R_{\text{thJS}} = f(t_p)$

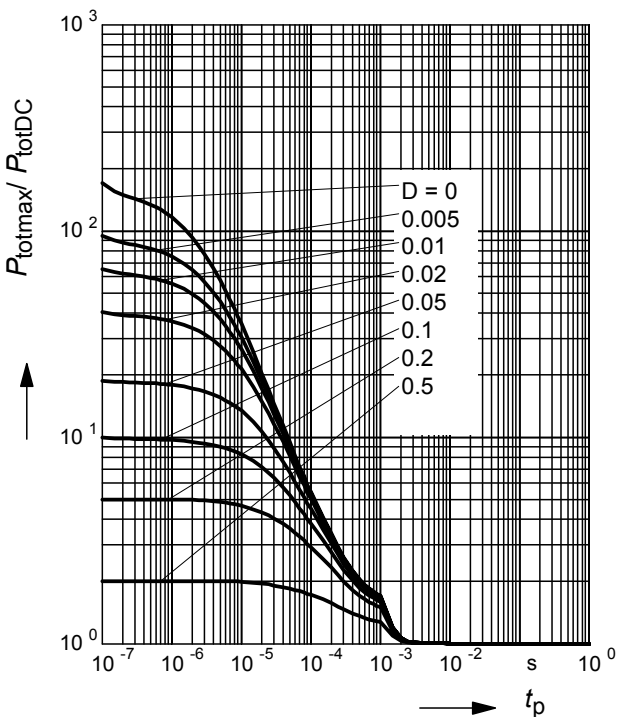
BC847BL3, BC848BL3



Permissible Pulse Load

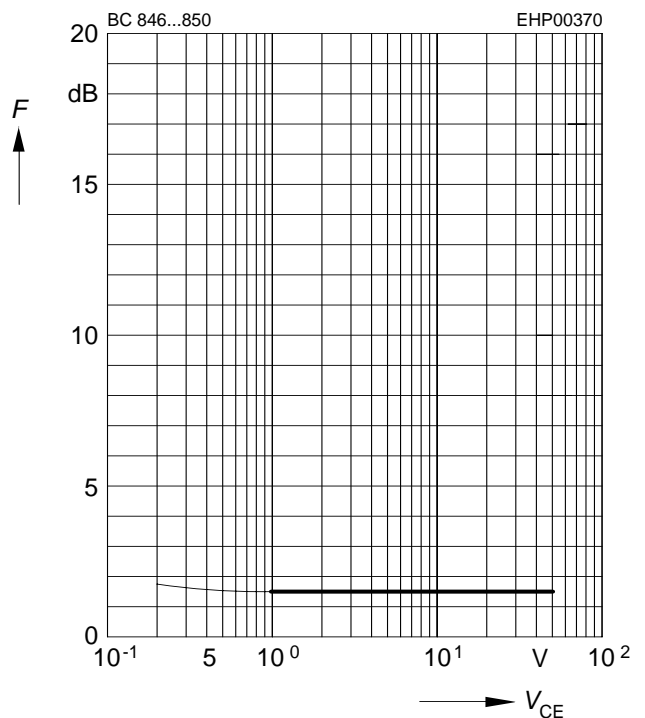
$$P_{\text{totmax}}/P_{\text{totDC}} = f(t_p)$$

BC847BL3, BC848BL3



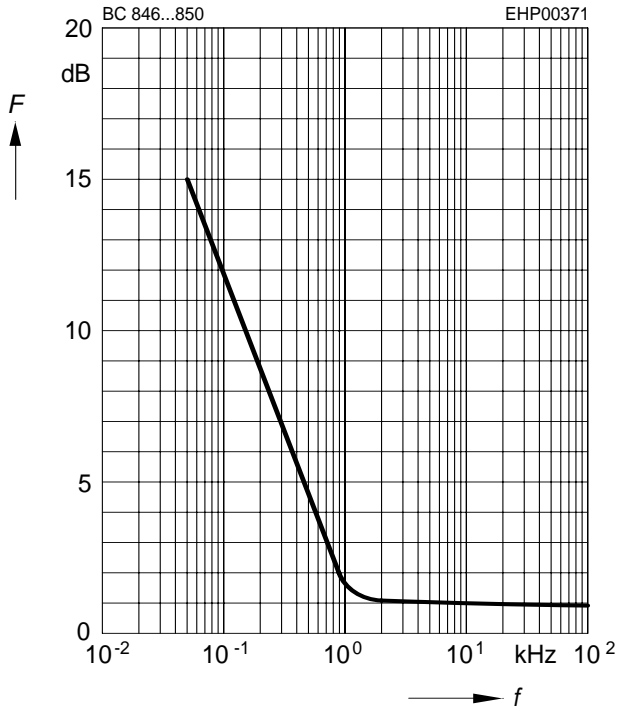
Noise figure $F = f(V_{\text{CE}})$

$I_C = 0.2\text{mA}$, $R_S = 2\text{k}\Omega$, $f = 1\text{kHz}$



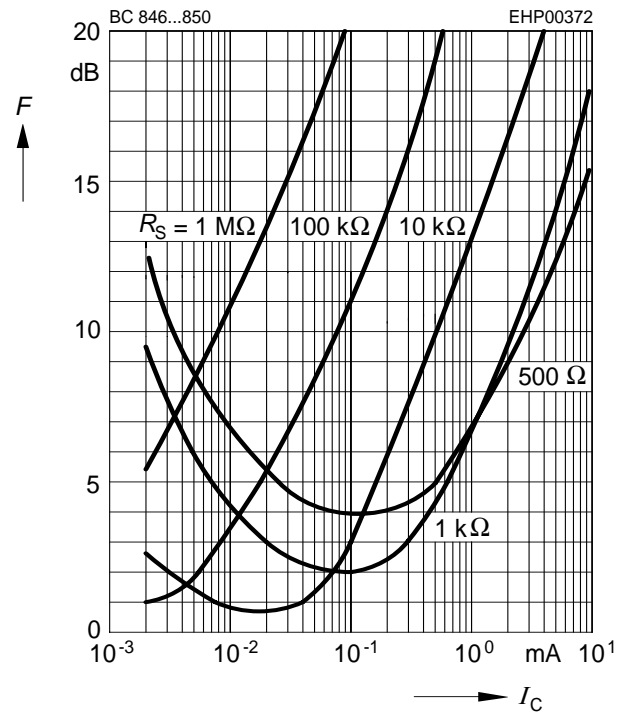
Noise figure $F = f(f)$

$I_C = 0.2 \text{ mA}$, $V_{CE} = 5\text{V}$, $R_S = 2 \text{ k}\Omega$



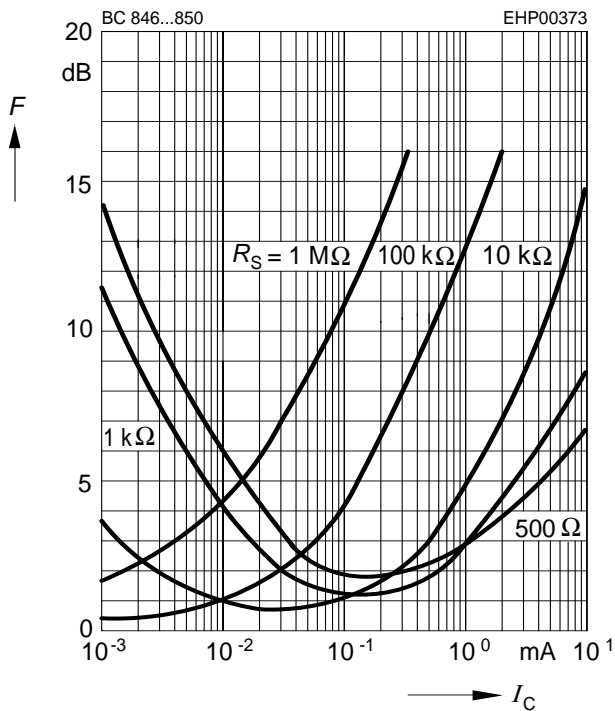
Noise figure $F = f(I_C)$

$V_{CE} = 5\text{V}$, $f = 120\text{Hz}$



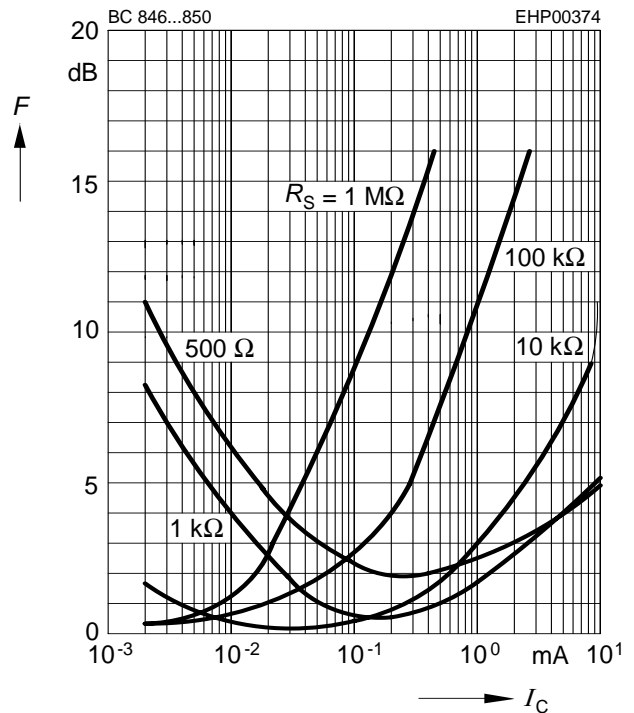
Noise figure $F = f(I_C)$

$V_{CE} = 5\text{V}$, $f = 1\text{kHz}$

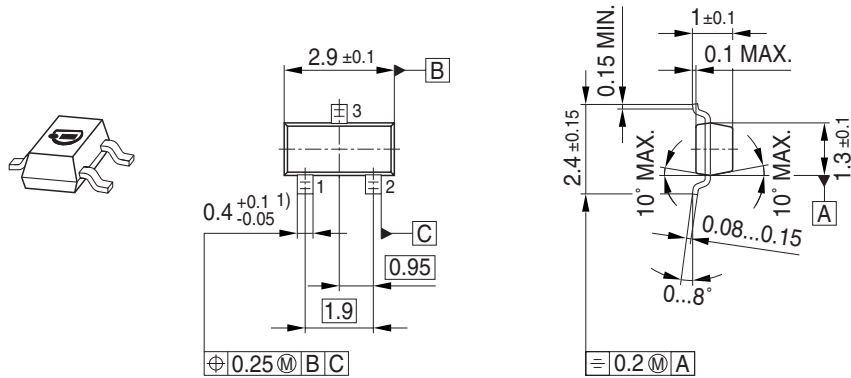


Noise figure $F = f(I_C)$

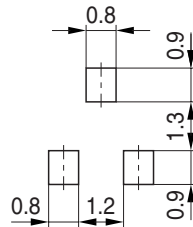
$V_{CE} = 5\text{V}$, $f = 10\text{kHz}$



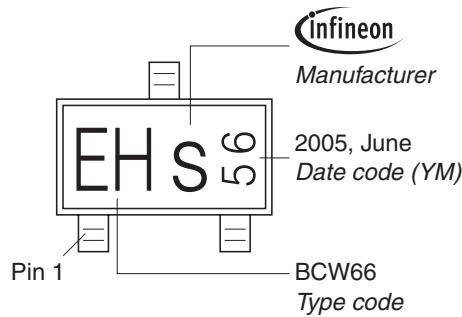
Package Outline



Foot Print

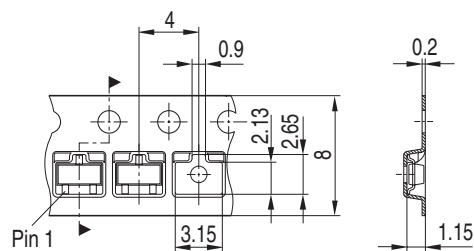


Marking Layout (Example)

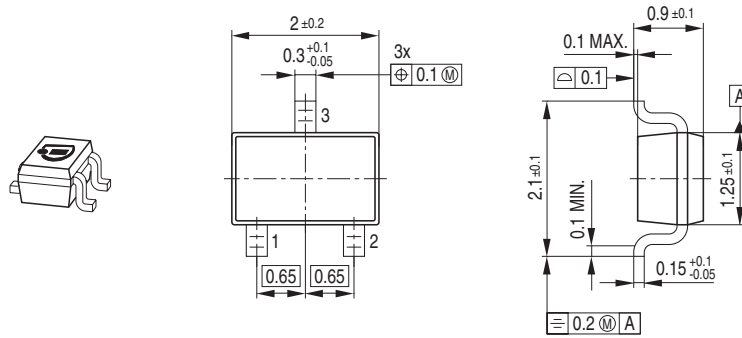


Standard Packing

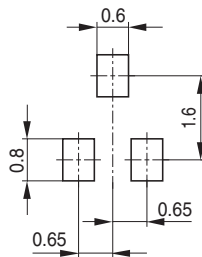
Reel \varnothing 180 mm = 3.000 Pieces/Reel
 Reel \varnothing 330 mm = 10.000 Pieces/Reel



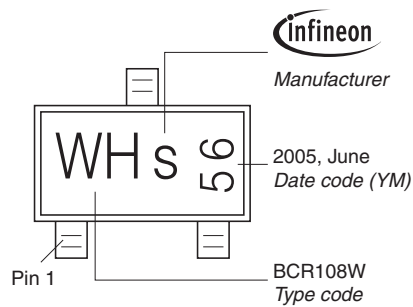
Package Outline



Foot Print

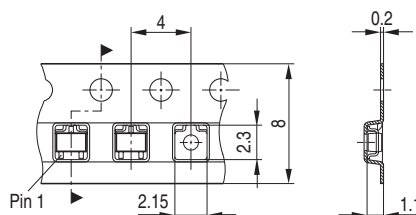


Marking Layout (Example)

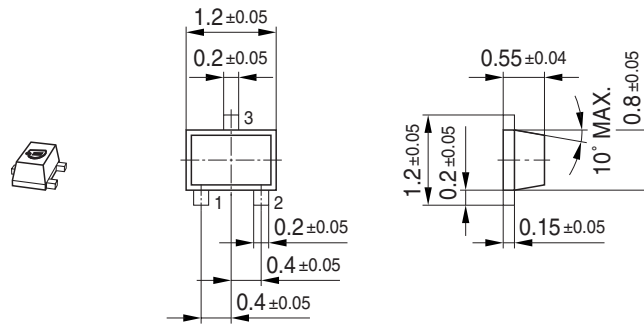


Standard Packing

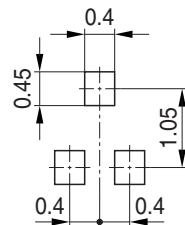
Reel $\varnothing 180$ mm = 3.000 Pieces/Reel
 Reel $\varnothing 330$ mm = 10.000 Pieces/Reel



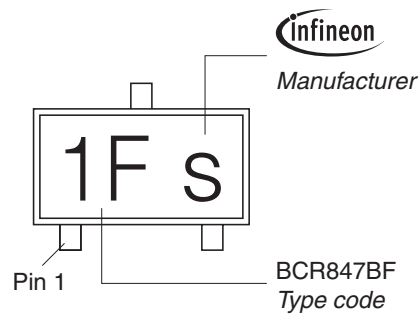
Package Outline



Foot Print

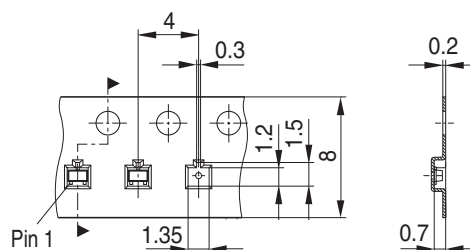


Marking Layout (Example)



Standard Packing

Reel ø180 mm = 3.000 Pieces/Reel
 Reel ø330 mm = 10.000 Pieces/Reel



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