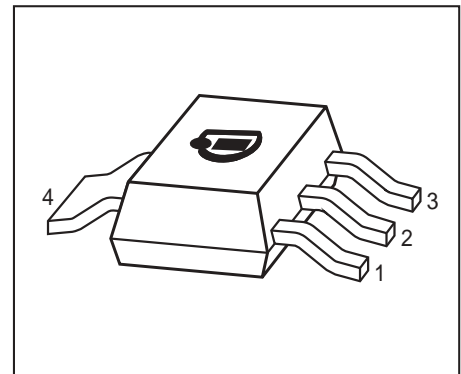


**NPN Silicon Darlington Transistors**

- High collector current
- Low collector-emitter saturation voltage
- Complementary types: BSP60 - BSP52 (PNP)
- Pb-free (RoHS compliant) package <sup>1)</sup>
- Qualified according AEC Q101



Type	Marking	Pin Configuration						Package
		1=B	2=C	3=E	4=C	-	-	
BSP50	BSP50	1=B	2=C	3=E	4=C	-	-	SOT223
BSP51	BSP51	1=B	2=C	3=E	4=C	-	-	SOT223
BSP52	BSP52	1=B	2=C	3=E	4=C	-	-	SOT223

**Maximum Ratings**

Parameter	Symbol	Value	Unit
Collector-emitter voltage	$V_{CEO}$		V
BSP50		45	
BSP51		60	
BSP52		80	
Collector-base voltage	$V_{CBO}$		
BSP50		60	
BSP51		80	
BSP52		90	
Emitter-base voltage	$V_{EBO}$	5	
Collector current	$I_C$	1	A
Peak collector current	$I_{CM}$	2	
Base current	$I_B$	100	mA
Total power dissipation- $T_S \leq 124\text{ °C}$	$P_{tot}$	1.5	W
Junction temperature	$T_j$	150	°C
Storage temperature	$T_{stg}$	-65 ... 150	

<sup>1</sup>Pb-containing package may be available upon special request

**Thermal Resistance**

Parameter	Symbol	Value	Unit
Junction - soldering point <sup>1)</sup>	$R_{thJS}$	$\leq 17$	K/W

**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 $I_C = 10 \text{ mA}$ , $I_B = 0$ , BSP50 $I_C = 10 \text{ mA}$ , $I_B = 0$ , BSP51 $I_C = 10 \text{ mA}$ , $I_B = 0$ , BSP52	$V_{(BR)CEO}$	45 60 80	- - -	- - -	V
Collector-base breakdown voltage $I_C = 100 \mu\text{A}$ , $I_E = 0$ , BSP50 $I_C = 100 \mu\text{A}$ , $I_E = 0$ , BSP51 $I_C = 100 \mu\text{A}$ , $I_E = 0$ , BSP52	$V_{(BR)CBO}$	60 80 90	- - -	- - -	
Emitter-base breakdown voltage $I_E = 100 \mu\text{A}$ , $I_C = 0$	$V_{(BR)EBO}$	5	-	-	
Collector-emitter cutoff current $V_{CE} = V_{CE0max}$ , $V_{BE} = 0$	$I_{CES}$	-	-	10	$\mu\text{A}$
Emitter-base cutoff current $V_{EB} = 4 \text{ V}$ , $I_C = 0$	$I_{EBO}$	-	-	10	$\mu\text{A}$
DC current gain <sup>2)</sup> $I_C = 150 \text{ mA}$ , $V_{CE} = 10 \text{ V}$ $I_C = 500 \text{ mA}$ , $V_{CE} = 10 \text{ V}$	$h_{FE}$	1000 2000	- -	- -	-
Collector-emitter saturation voltage <sup>2)</sup> $I_C = 500 \text{ mA}$ , $I_B = 0.5 \text{ mA}$ $I_C = 1 \text{ A}$ , $I_B = 1 \text{ mA}$	$V_{CEsat}$	- -	- -	1.3 1.8	V
Base emitter saturation voltage <sup>2)</sup> $I_C = 500 \text{ mA}$ , $I_B = 0.5 \text{ mA}$ $I_C = 1 \text{ mA}$ , $I_B = 1 \text{ A}$	$V_{BEsat}$	- -	- -	1.9 2.2	

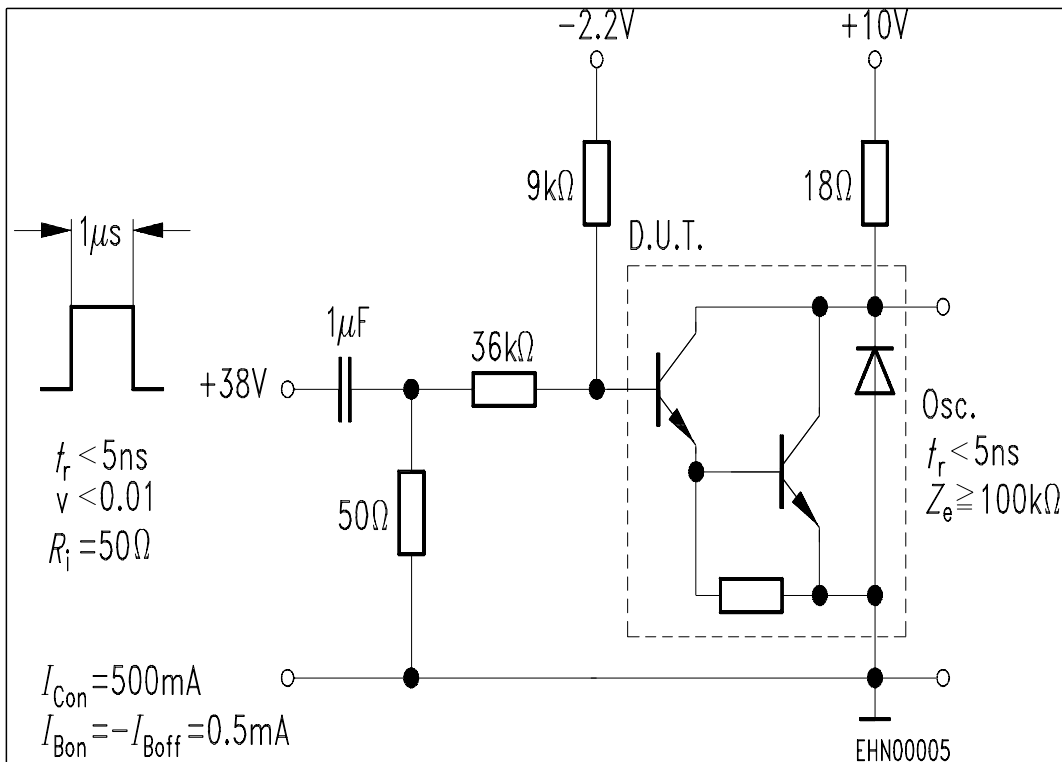
<sup>1)</sup>For calculation of  $R_{thJA}$  please refer to Application Note Thermal Resistance

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

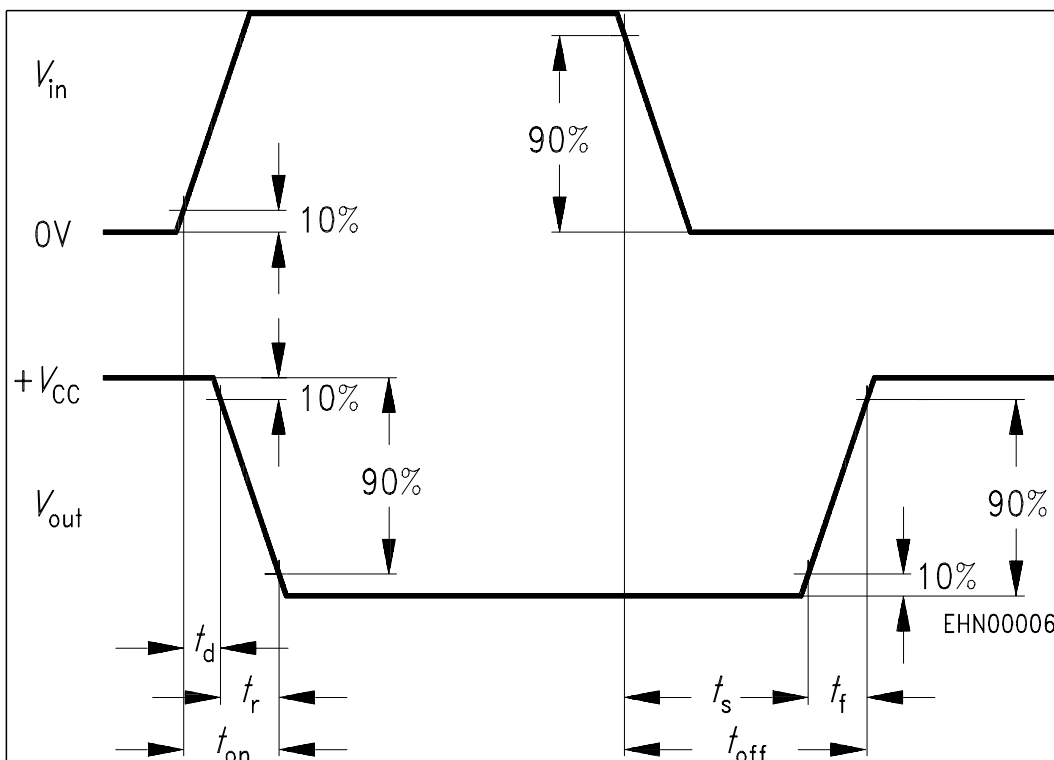
**Electrical Characteristics** at  $T_A = 25^\circ\text{C}$ , unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>AC Characteristics</b>					
Transition frequency $I_C = 100\text{ mA}, V_{CE} = 5\text{ V}, f = 100\text{ MHz}$	$f_T$	-	200	-	MHz
Turn-on time $I_C = 500\text{ mA}, I_{B1} = I_{B2} = 0.5\text{ mA}$	$t_{(on)}$	-	400	-	ns
Turn-off time $I_C = 500\text{ mA}, I_{B1} = I_{B2} = 0.5\text{ mA}$	$t_{(off)}$	-	1500	-	

Switching time test circuit

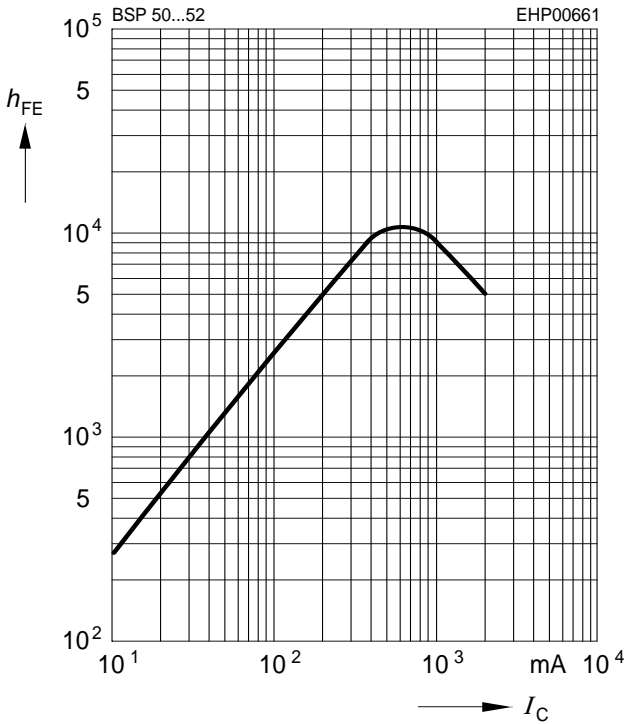


Switching time waveform



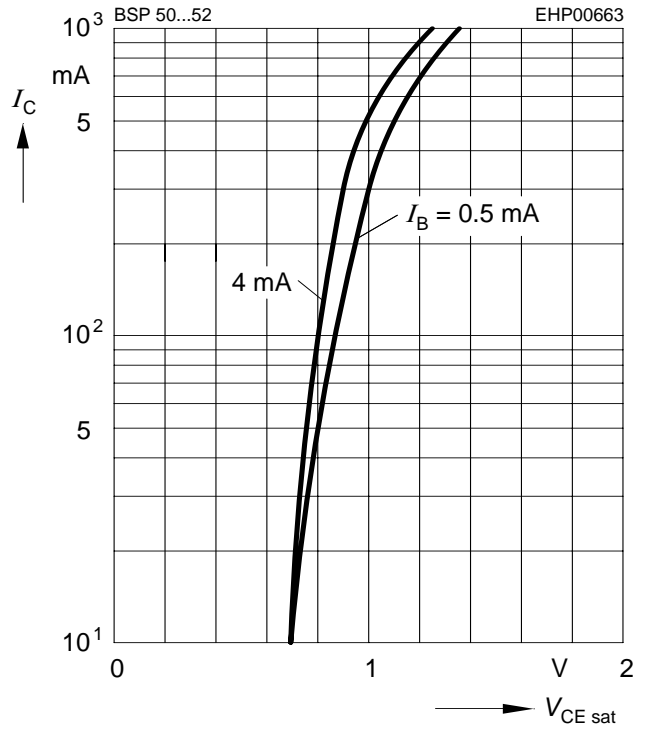
**DC current gain  $h_{FE} = f(I_C)$**

$V_{CE} = 10\text{ V}$



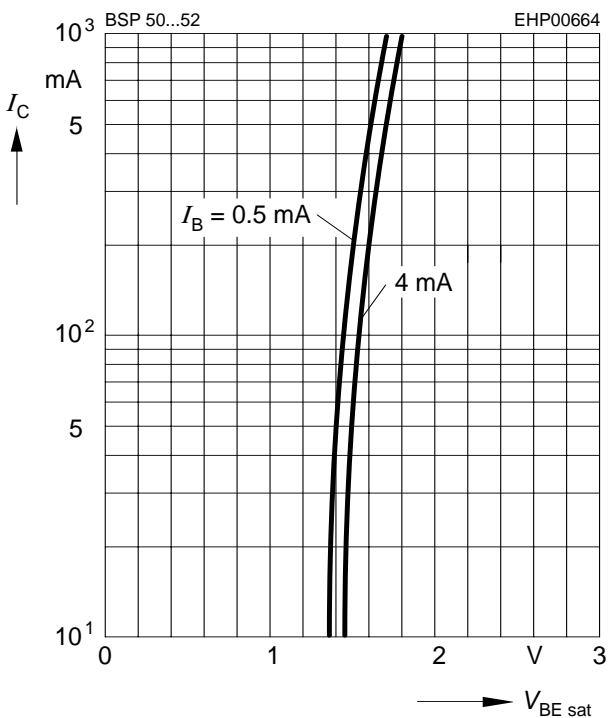
**Collector-emitter saturation voltage**

$I_C = f(V_{CEsat}), I_B = \text{Parameter}$



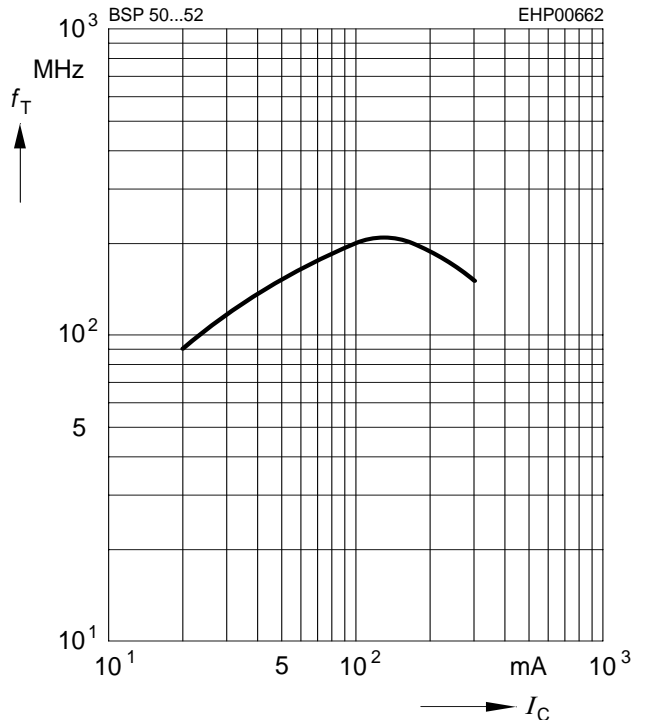
**Base-emitter saturation voltage**

$I_C = f(V_{BEsat}), I_B = \text{Parameter}$



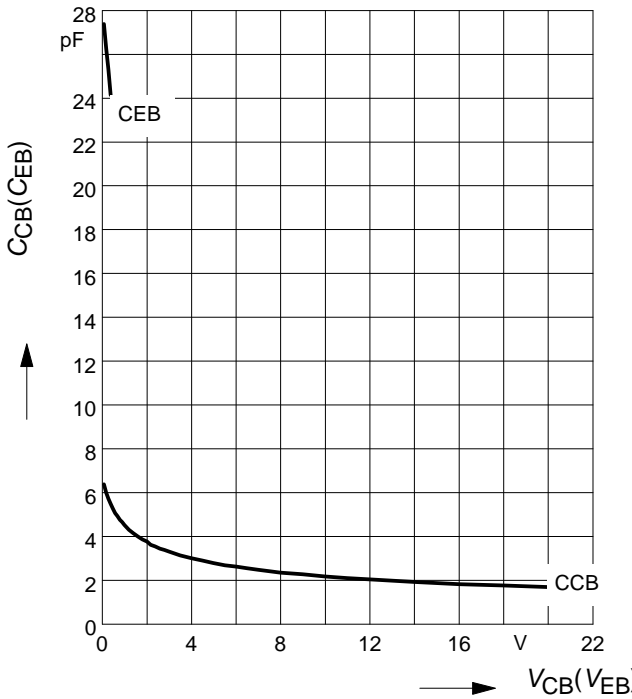
**Transition frequency  $f_T = f(I_C)$**

$V_{CE} = 5\text{ V}, f = 100\text{ MHz}$

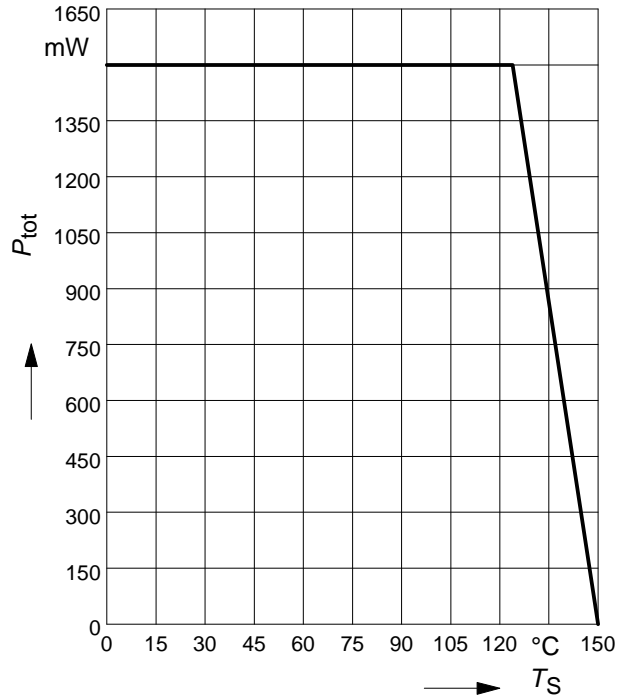


Collector-base capacitance  $C_{cb} = f(V_{CB})$

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

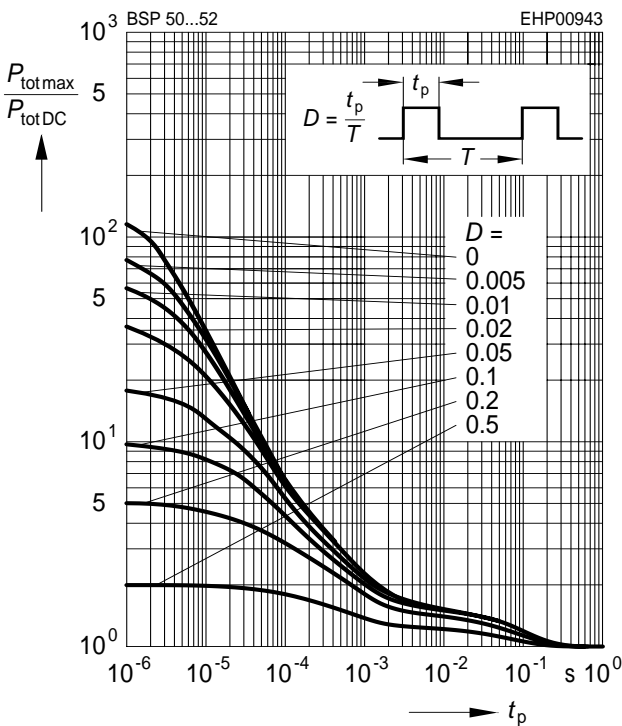


Total power dissipation  $P_{tot} = f(T_S)$



Permissible Pulse Load

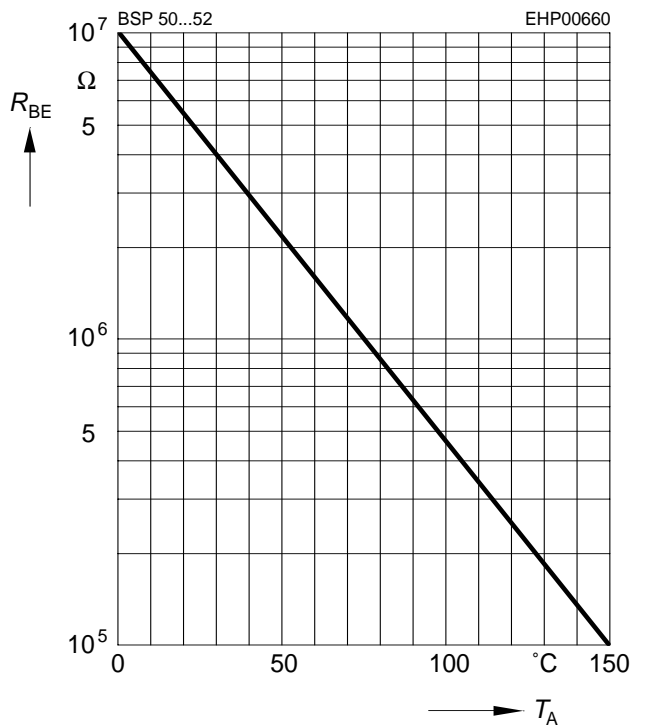
$P_{totmax}/P_{totDC} = f(t_p)$



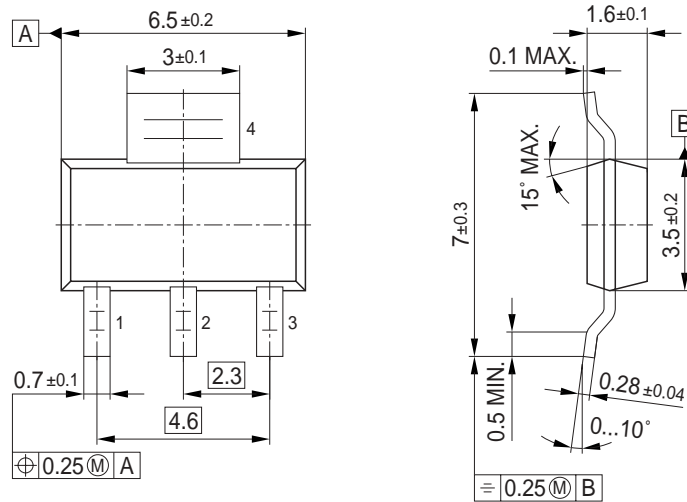
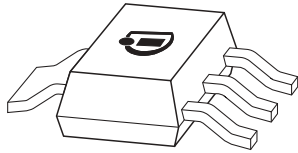
External resistance  $R_{BE} = f(T_A)**$

$V_{CB} = V_{CEmax}$

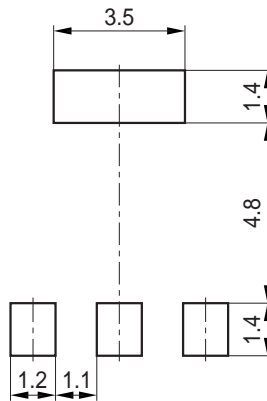
\*\*  $R_{BEmax}$  for thermal stability



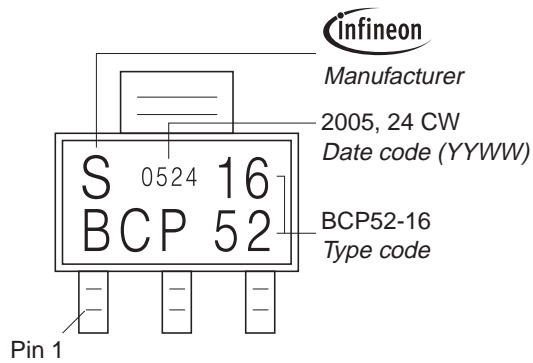
Package Outline



Foot Print

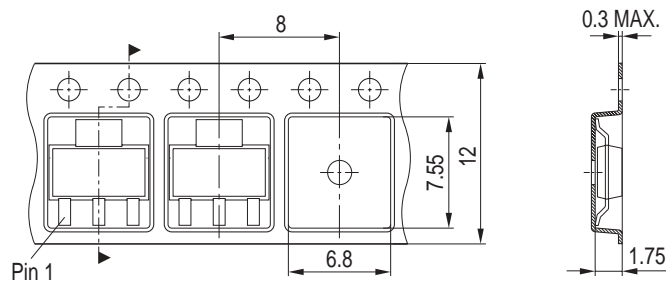


Marking Layout (Example)



Packing

Reel  $\varnothing 180 \text{ mm}$  = 1.000 Pieces/Reel  
 Reel  $\varnothing 330 \text{ mm}$  = 4.000 Pieces/Reel



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