

NPN Silicon Darlington Transistors

- High collector current
- Low collector-emitter saturation voltage
- Complementary types: BSP60 - BSP62 (PNP)
- Pb-free (RoHS compliant) package
- 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, $t_p \leq 10$ ms | I_{CM} | 2 | |
| Base current | I_B | 100 | mA |
| Total power dissipation- $T_S \leq 124$ °C | P_{tot} | 1.5 | W |
| Junction temperature | T_j | 150 | °C |
| Storage temperature | T_{stg} | -65 ... 150 | |

Thermal Resistance

| Parameter | Symbol | Value | Unit |
|--|------------|-----------|------|
| Junction - soldering point ¹⁾ | R_{thJS} | ≤ 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 | μA |
| Emitter-base cutoff current $V_{EB} = 4 \text{ V}$, $I_C = 0$ | I_{EBO} | - | - | 10 | μA |
| DC current gain ²⁾ $I_C = 150 \text{ mA}$, $V_{CE} = 10 \text{ V}$ $I_C = 500 \text{ mA}$, $V_{CE} = 10 \text{ V}$ | h_{FE} | 1000 2000 | - - | - - | - |
| Collector-emitter saturation voltage ²⁾ $I_C = 500 \text{ mA}$, $I_B = 0.5 \text{ mA}$ $I_C = 1 \text{ A}$, $I_B = 1 \text{ mA}$ | V_{CEsat} | - - | - - | 1.3 1.8 | V |
| Base emitter saturation voltage ²⁾ $I_C = 500 \text{ mA}$, $I_B = 0.5 \text{ mA}$ $I_C = 1 \text{ mA}$, $I_B = 1 \text{ A}$ | V_{BEsat} | - - | - - | 1.9 2.2 | |

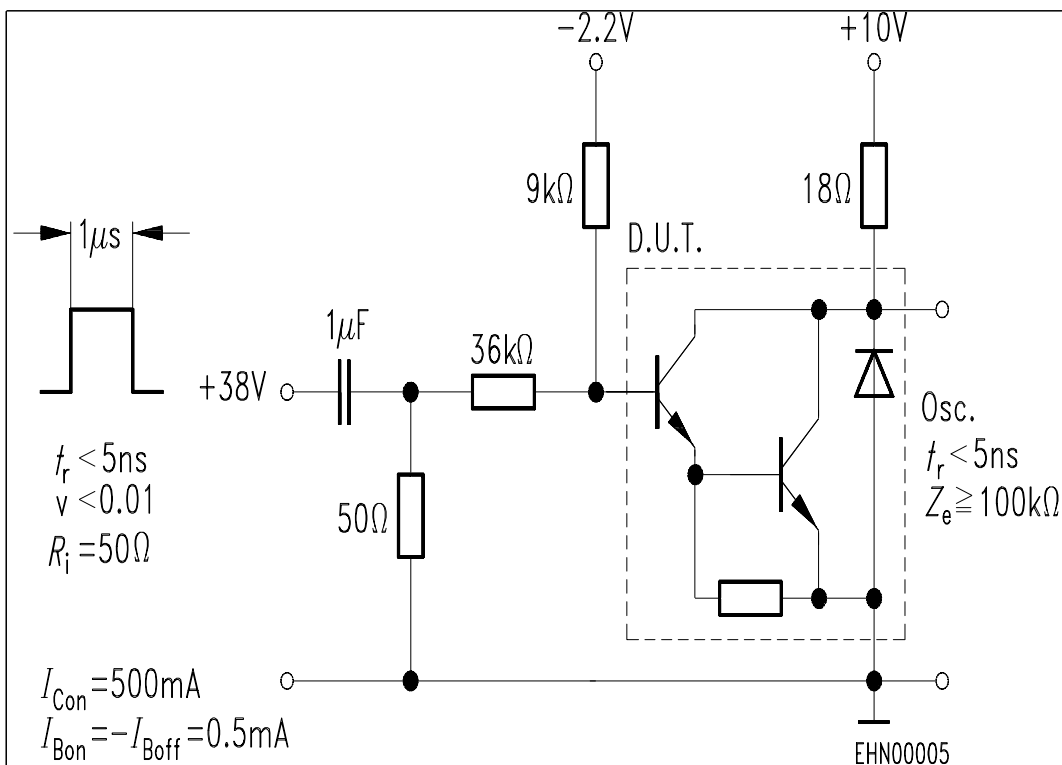
¹⁾For calculation of R_{thJA} please refer to Application Note AN077 (Thermal Resistance Calculation)

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

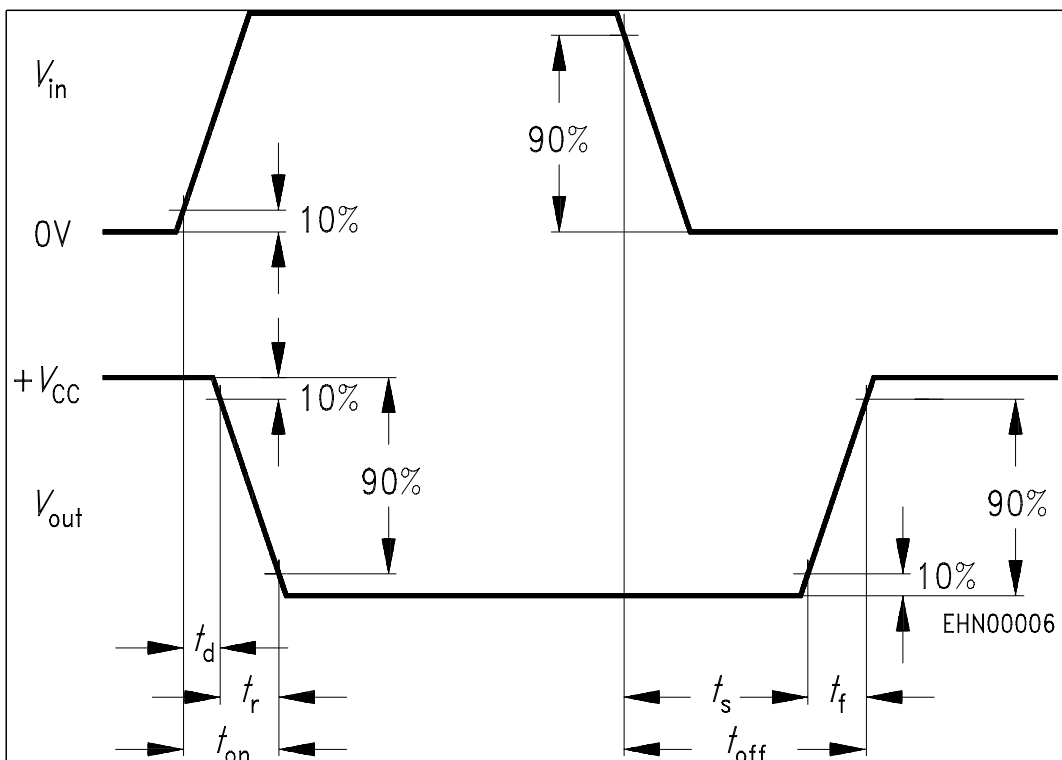
Electrical Characteristics at $T_A = 25^\circ\text{C}$, unless otherwise specified

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

Switching time test circuit

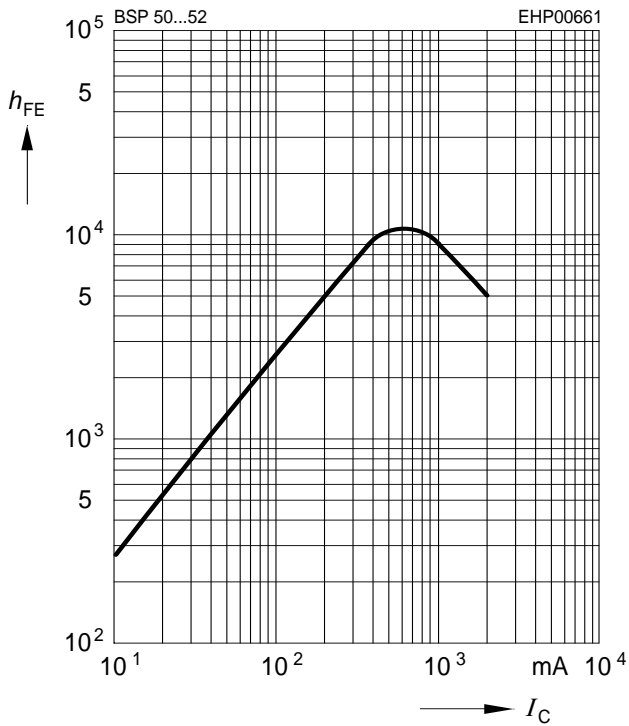


Switching time waveform



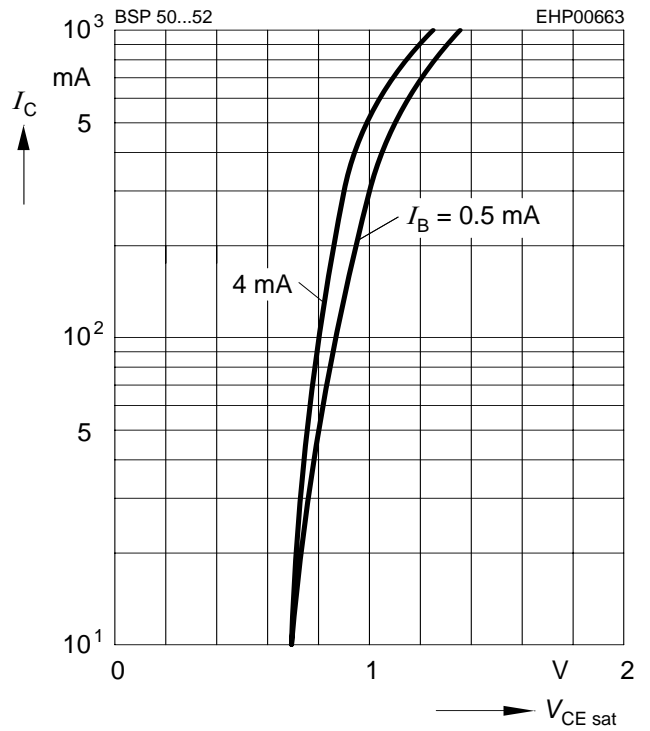
DC current gain $h_{FE} = f(I_C)$

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



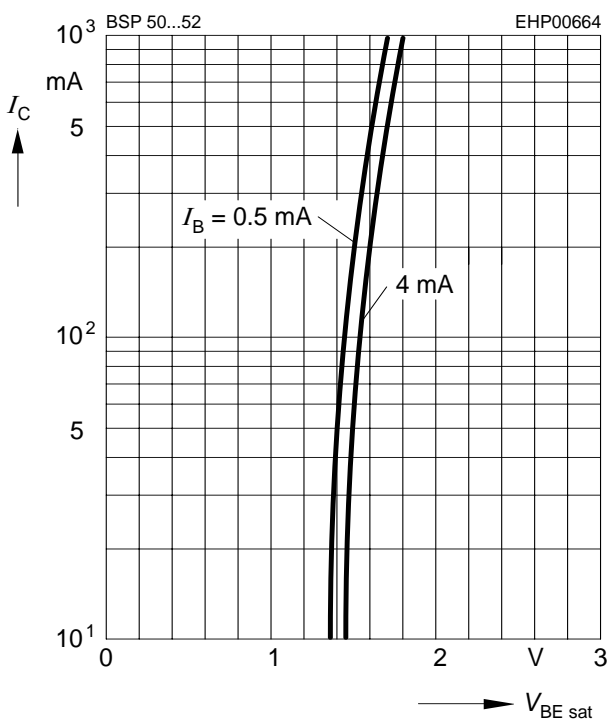
Collector-emitter saturation voltage

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



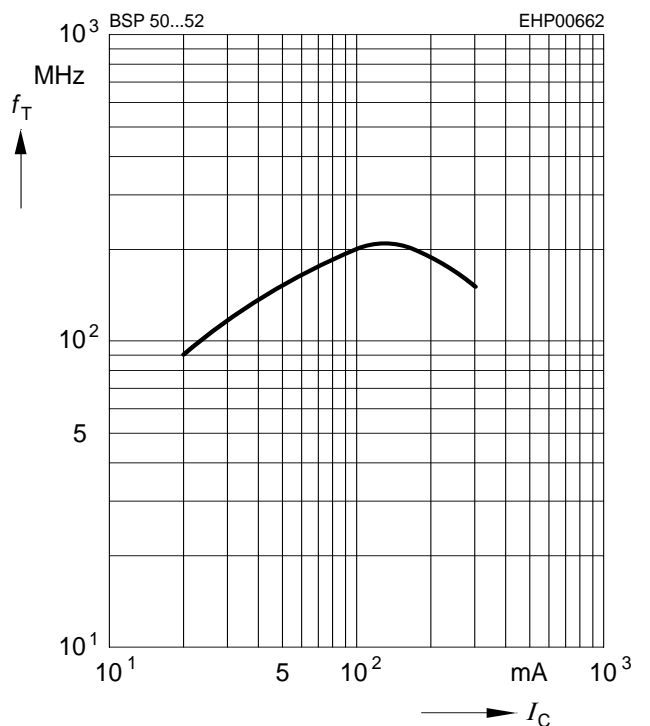
Base-emitter saturation voltage

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



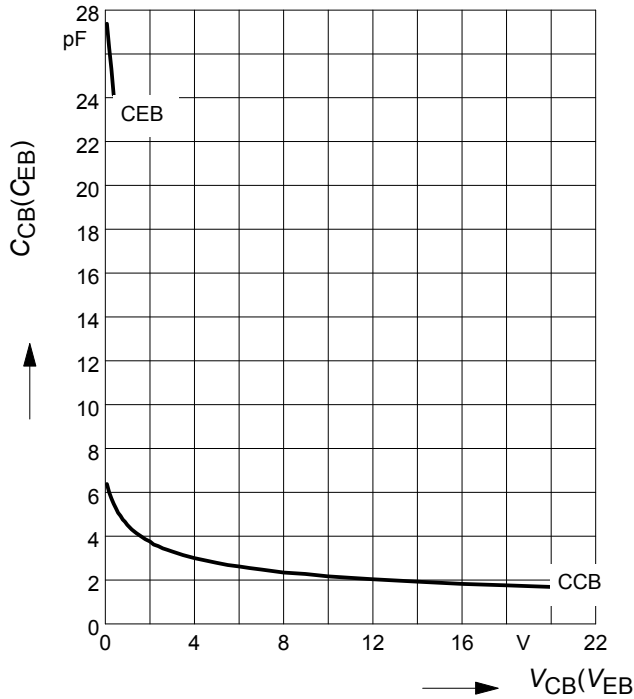
Transition frequency $f_T = f(I_C)$

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

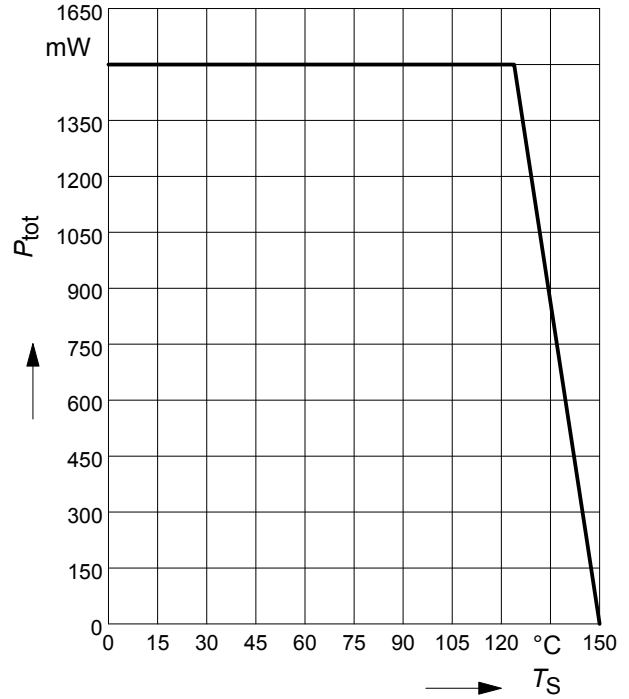


Collector-base capacitance $C_{cb} = f(V_{CB})$

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

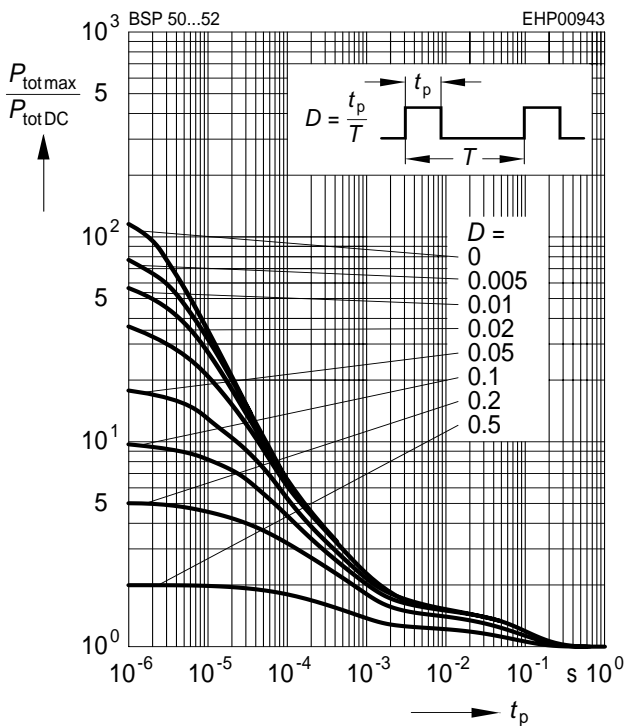


Total power dissipation $P_{tot} = f(T_S)$



Permissible Pulse Load

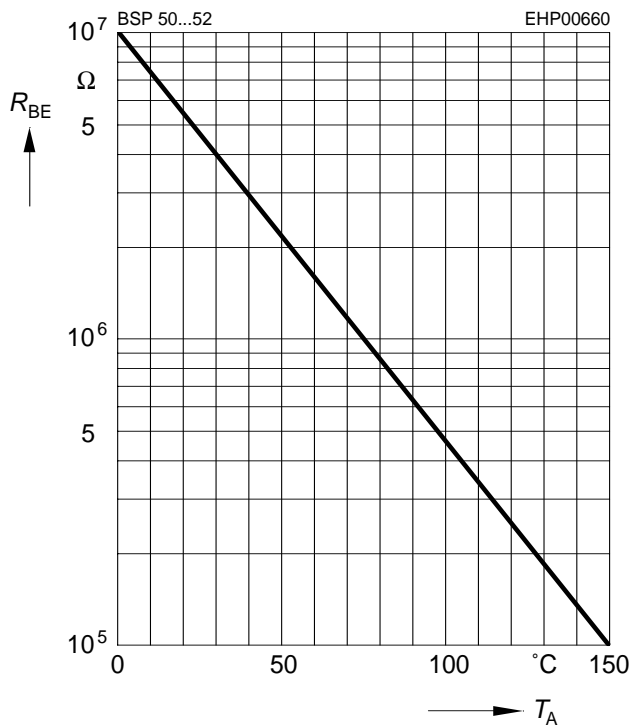
$P_{totmax}/P_{totDC} = f(t_p)$



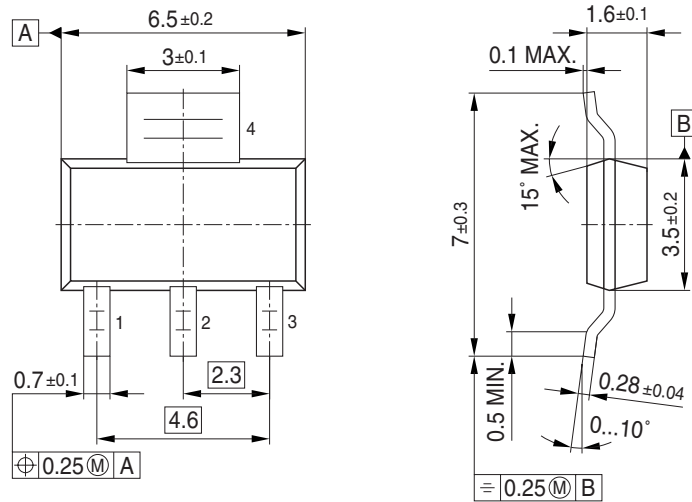
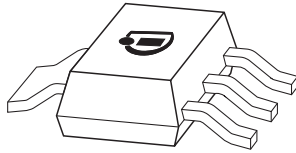
External resistance $R_{BE} = f(T_A)^{**}$

$V_{CB} = V_{CEmax}$

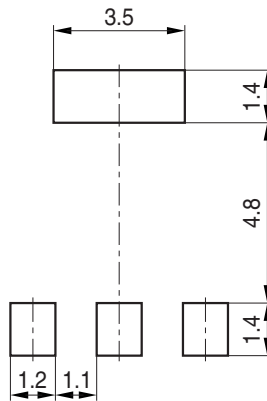
** R_{BEmax} for thermal stability



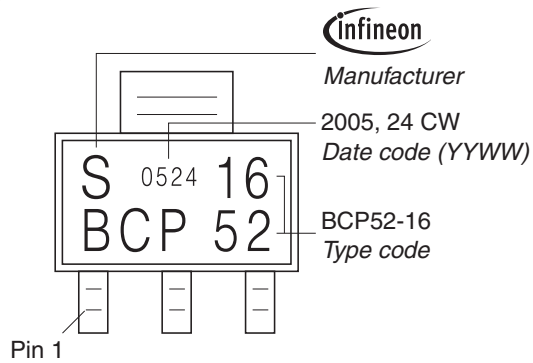
Package Outline



Foot Print

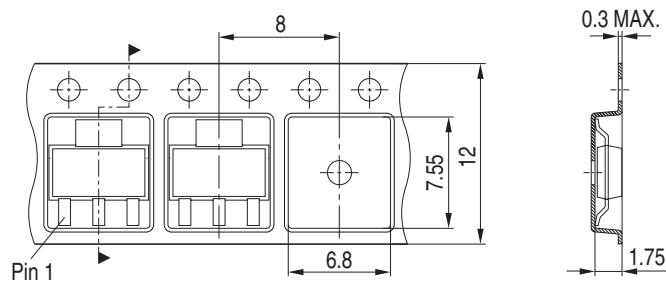


Marking Layout (Example)



Packing

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



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