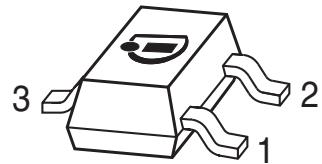


### NPN Silicon Switching Transistor

- Low collector-emitter saturation voltage
- Complementary type:  
SMBT2907A / MMBT2907A (PNP)
- Pb-free (RoHS compliant) package
- Qualified according AEC Q101



Type	Marking	Pin Configuration			Package
SMBT2222A/MMBT2222A	s1P	1 = B	2 = E	3 = C	SOT23

### Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	$V_{CEO}$	40	V
Collector-base voltage	$V_{CBO}$	75	
Emitter-base voltage	$V_{EBO}$	6	
Collector current	$I_C$	600	mA
Total power dissipation- $T_S \leq 77 \text{ }^\circ\text{C}$	$P_{tot}$	330	mW
Junction temperature	$T_j$	150	$^\circ\text{C}$
Storage temperature	$T_{stg}$	-65 ... 150	

### Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point <sup>1)</sup>	$R_{thJS}$	$\leq 220$	K/W

<sup>1</sup>For calculation of  $R_{thJA}$  please refer to Application Note AN077 (Thermal Resistance Calculation)

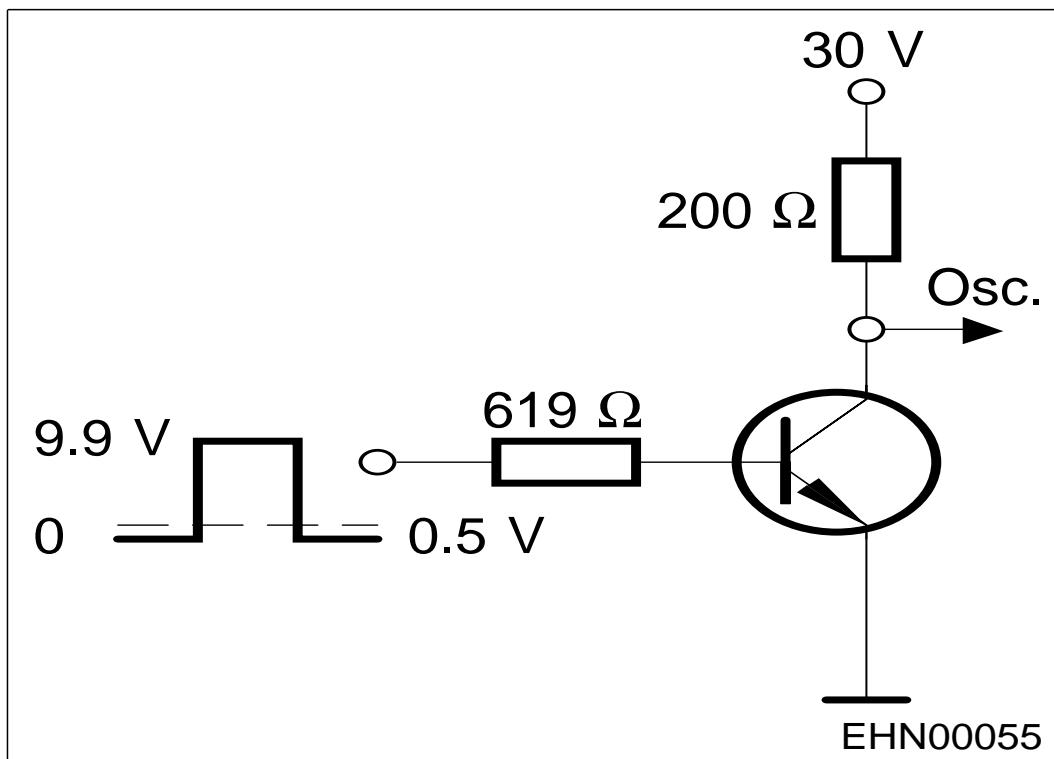
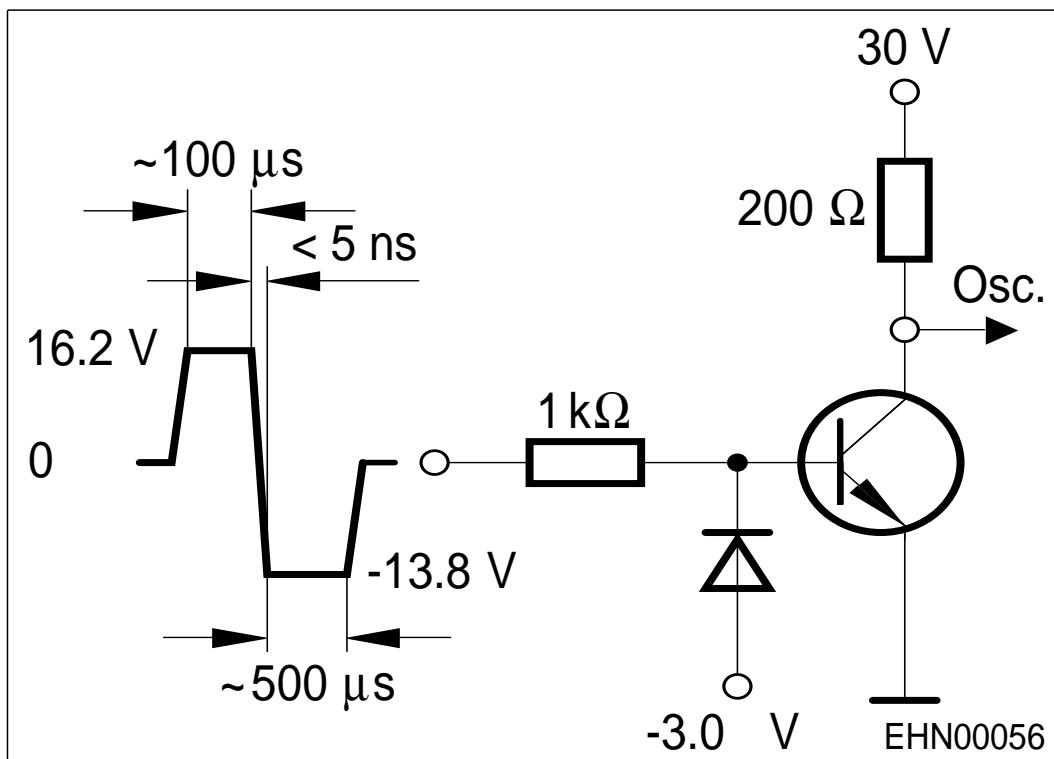
**Electrical Characteristics at  $T_A = 25^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>DC Characteristics</b>					
Collector-emitter breakdown voltage $I_C = 10 \text{ mA}, I_B = 0$	$V_{(\text{BR})\text{CEO}}$	40	-	-	V
Collector-base breakdown voltage $I_C = 10 \mu\text{A}, I_E = 0$	$V_{(\text{BR})\text{CBO}}$	75	-	-	
Emitter-base breakdown voltage $I_E = 10 \mu\text{A}, I_C = 0$	$V_{(\text{BR})\text{EBO}}$	6	-	-	
Collector-base cutoff current $V_{CB} = 60 \text{ V}, I_E = 0$ $V_{CB} = 60 \text{ V}, I_E = 0, T_A = 150^\circ\text{C}$	$I_{\text{CBO}}$	-	-	0.01 10	$\mu\text{A}$
Emitter-base cutoff current $V_{EB} = 3 \text{ V}, I_C = 0$	$I_{\text{EBO}}$	-	-	10	nA
DC current gain <sup>1)</sup> $I_C = 100 \mu\text{A}, V_{CE} = 10 \text{ V}$ $I_C = 1 \text{ mA}, V_{CE} = 10 \text{ V}$ $I_C = 10 \text{ mA}, V_{CE} = 10 \text{ V}$ $I_C = 150 \text{ mA}, V_{CE} = 1 \text{ V}$ $I_C = 150 \text{ mA}, V_{CE} = 10 \text{ V}$ $I_C = 500 \text{ mA}, V_{CE} = 10 \text{ V}$	$h_{\text{FE}}$	35 50 75 50 100 40	-	-	-
Collector-emitter saturation voltage <sup>1)</sup> $I_C = 150 \text{ mA}, I_B = 15 \text{ mA}$ $I_C = 500 \text{ mA}, I_B = 50 \text{ mA}$	$V_{\text{CEsat}}$	-	-	0.3 1	V
Base emitter saturation voltage <sup>1)</sup> $I_C = 150 \text{ mA}, I_B = 15 \text{ mA}$ $I_C = 500 \text{ mA}, I_B = 50 \text{ mA}$	$V_{\text{BESat}}$	0.6 -	-	1.2 2	

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

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

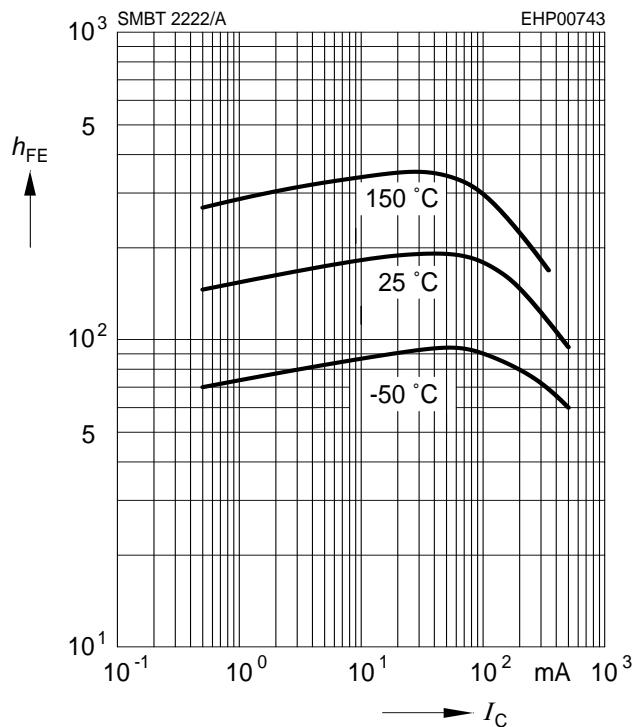
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>AC Characteristics</b>					
Transition frequency $I_C = 20 \text{ mA}, V_{CE} = 20 \text{ V}, f = 100 \text{ MHz}$	$f_T$	300	-	-	MHz
Collector-base capacitance $V_{CB} = 10 \text{ V}, f = 1 \text{ MHz}$	$C_{cb}$	-	2.5	5	pF
Emitter-base capacitance $V_{EB} = 0.5 \text{ V}, f = 1 \text{ MHz}$	$C_{eb}$	-	-	35	
Short-circuit input impedance $I_C = 1 \text{ mA}, V_{CE} = 10 \text{ V}, f = 1 \text{ kHz}$ $I_C = 10 \text{ mA}, V_{CE} = 10 \text{ V}, f = 1 \text{ kHz}$	$h_{11e}$	2 0.25	-	8 1.25	kΩ
Open-circuit reverse voltage transf. ratio $I_C = 1 \text{ mA}, V_{CE} = 10 \text{ V}, f = 1 \text{ kHz}$ $I_C = 10 \text{ mA}, V_{CE} = 10 \text{ V}, f = 1 \text{ kHz}$	$h_{12e}$	- -	- -	8 4	$10^{-4}$
Short-circuit forward current transf. ratio $I_C = 1 \text{ mA}, V_{CE} = 10 \text{ V}, f = 1 \text{ kHz}$ $I_C = 10 \text{ mA}, V_{CE} = 10 \text{ V}, f = 1 \text{ kHz}$	$h_{21e}$	50 75	- -	300 375	-
Open-circuit output admittance $I_C = 1 \text{ mA}, V_{CE} = 10 \text{ V}, f = 1 \text{ kHz}$ $I_C = 10 \text{ mA}, V_{CE} = 10 \text{ V}, f = 1 \text{ kHz}$	$h_{22e}$	5 25	- -	35 200	μS
Delay time $V_{CC} = 30 \text{ V}, I_C = 150 \text{ mA}, I_{B1} = 15 \text{ mA}, V_{BE(off)} = 0.5 \text{ V}$	$t_d$	-	-	10	ns
Rise time $V_{CC} = 30 \text{ V}, I_C = 150 \text{ mA}, I_{B1} = 15 \text{ mA}, V_{BE(off)} = 0.5 \text{ V}$	$t_r$	-	-	25	
Storage time $V_{CC} = 30 \text{ V}, I_C = 150 \text{ mA}, I_{B1} = I_{B2} = 15 \text{ mA}$	$t_{stg}$	-	-	225	
Fall time $V_{CC} = 30 \text{ V}, I_C = 150 \text{ mA}, I_{B1} = I_{B2} = 15 \text{ mA}$	$t_f$	-	-	60	
Noise figure $I_C = 100 \mu\text{A}, V_{CE} = 10 \text{ V}, f = 1 \text{ kHz}, \Delta f = 200 \text{ Hz}, R_S = 1 \text{ k}\Omega$	$F$	-	-	4	dB

**Test circuit**
**Delay and rise time**

**Storage and fall time**


**Oscillograph:**  $R > 100\Omega$ ,  $C < 12\text{pF}$ ,  $t_r < 5\text{ns}$

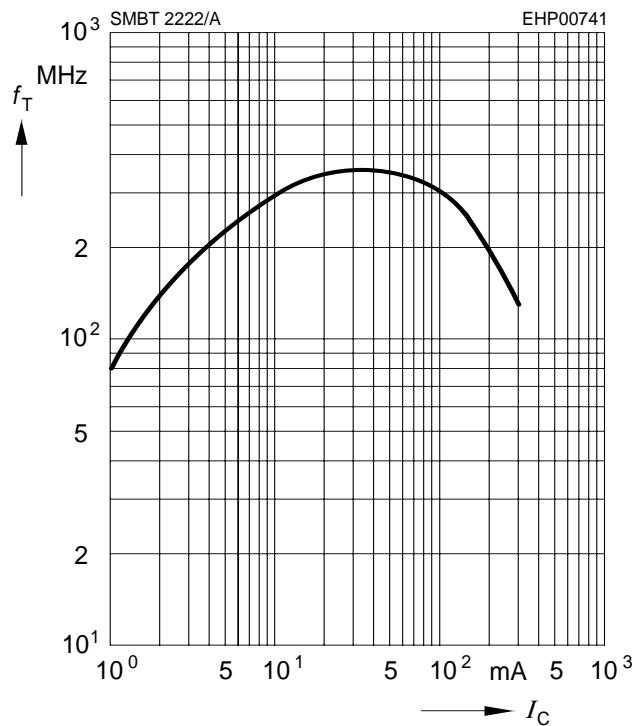
**DC current gain**  $h_{FE} = f(I_C)$

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



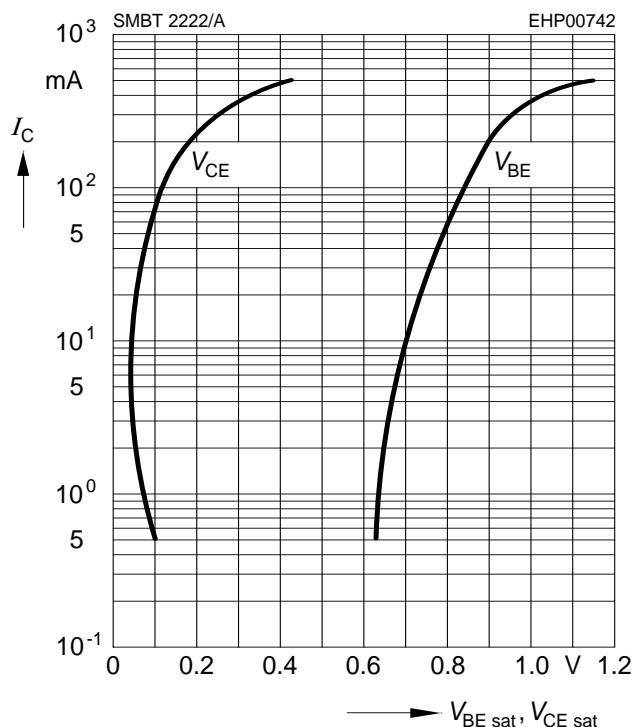
**Transition frequency**  $f_T = f(I_C)$

$V_{CE} = 20 \text{ V}$



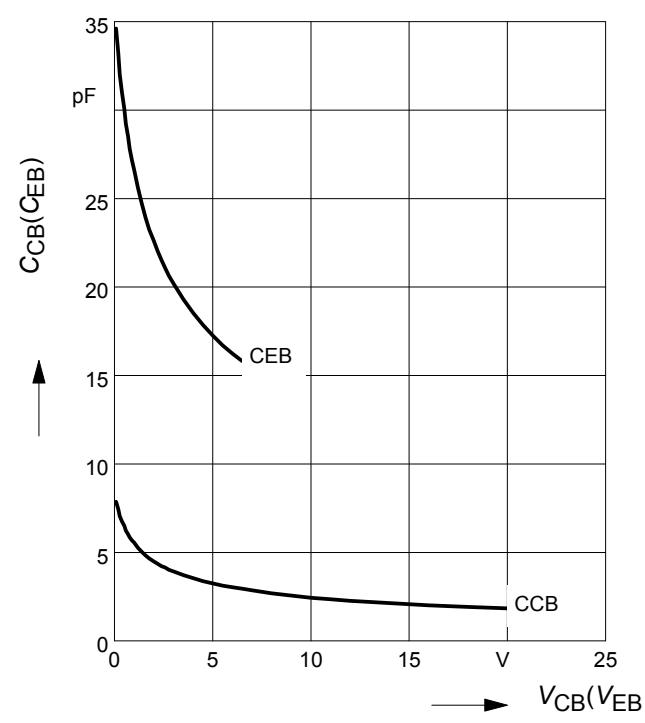
**Saturation voltage**  $I_C = f(V_{BEsat}, V_{CESat})$

$h_{FE} = 10$

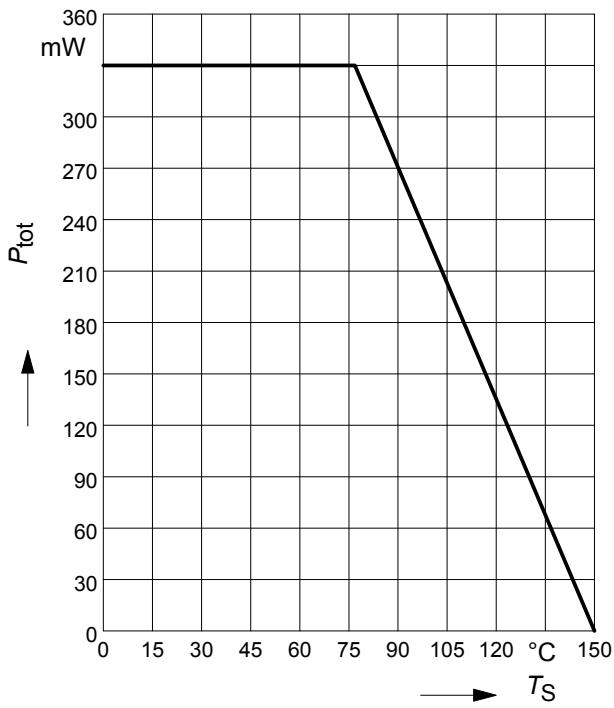


**Collector-base capacitance**  $C_{cb} = f(V_{CB})$

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

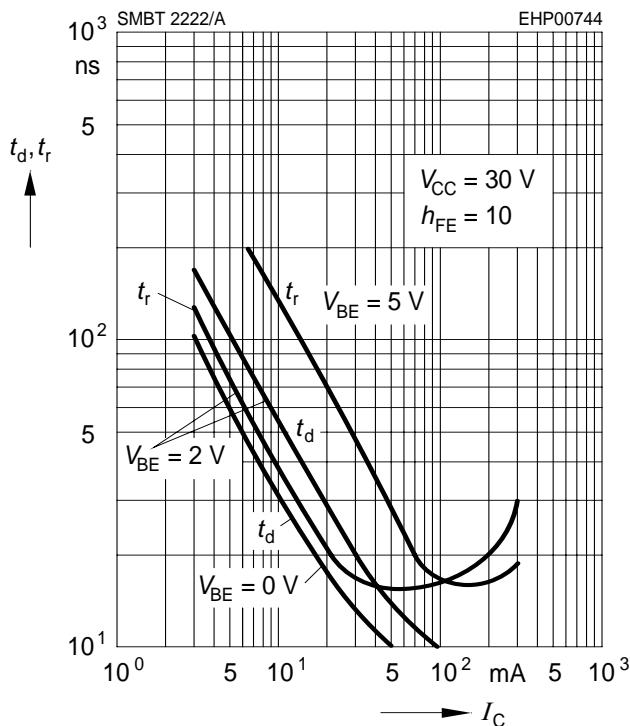


**Total power dissipation**  $P_{\text{tot}} = f(T_S)$



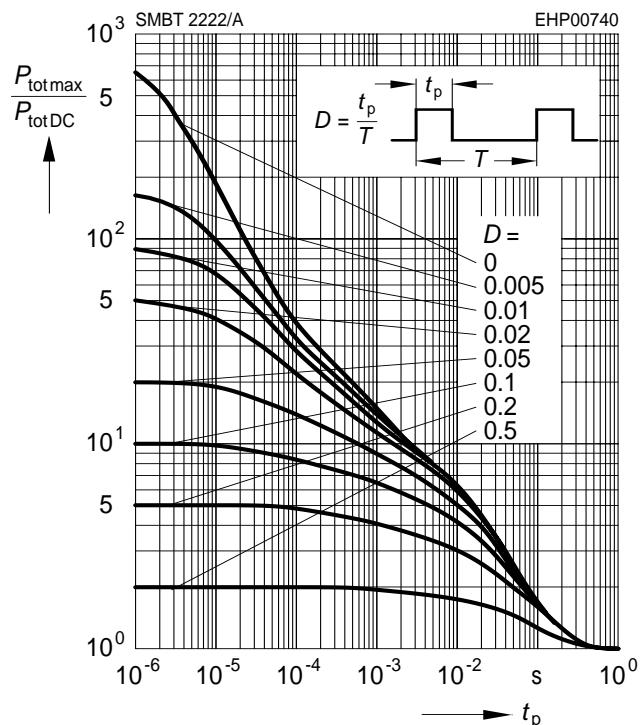
**Delay time**  $t_d = f(I_C)$

**Rise time**  $t_r = f(I_C)$



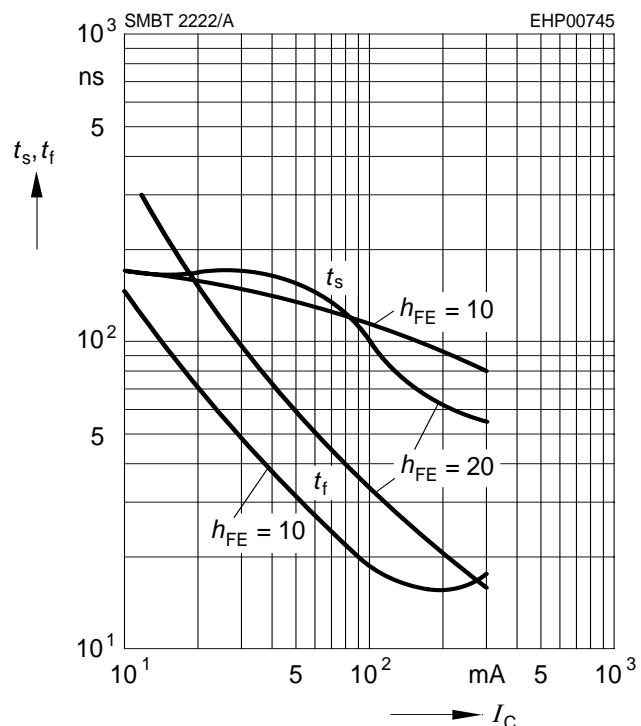
**Permissible Pulse Load**

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

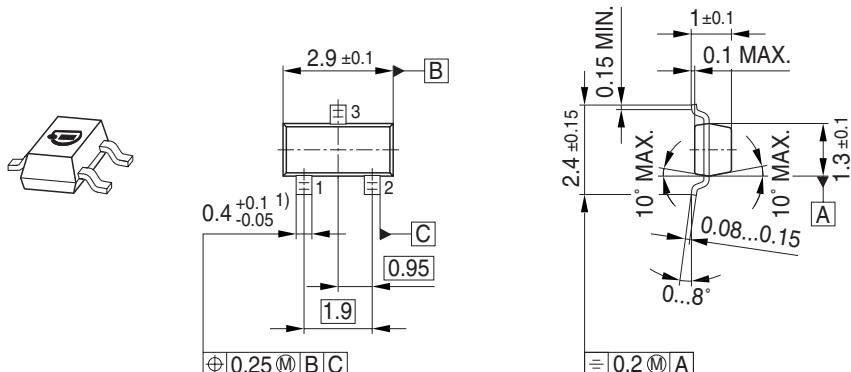


**Storage time**  $t_{\text{stg}} = f(I_C)$

**Fall time**  $t_f = f(I_C)$

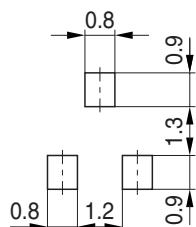


## Package Outline

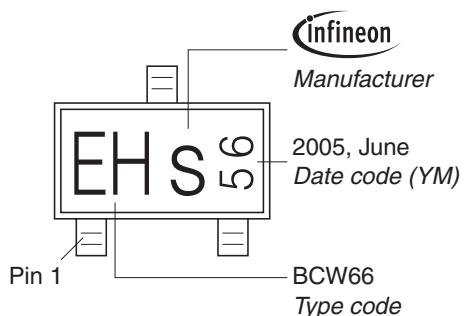


1) Lead width can be 0.6 max. in dambar area

## Foot Print

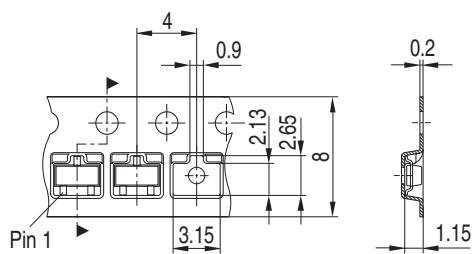


## Marking Layout (Example)



## Standard Packing

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



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