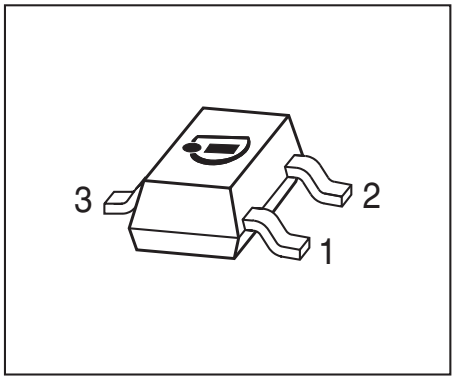
NPN Silicon Switching Transistor



- 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- $T_S \leq 77$ °C	P_{tot}	330	mW
Junction temperature	T_j	150	°C
Storage temperature	T_{stg}	-65 ... 150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point[1)]	R_{thJS}	≤ 220	K/W

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

Electrical Characteristics at T_A = 25°C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Collector-emitter breakdown voltage I_C = 10 mA, I_B = 0	$V_{(BR)CEO}$	40	-	-	V
Collector-base breakdown voltage I_C = 10 µA, I_E = 0	$V_{(BR)CBO}$	75	-	-	
Emitter-base breakdown voltage I_E = 10 µA, I_C = 0	$V_{(BR)EBO}$	6	-	-	
Collector-base cutoff current V_{CB} = 60 V, I_E = 0 V_{CB} = 60 V, I_E = 0 , T_A = 150 °C	I_{CBO}	 - -	 - -	 0.01 10	µA
Emitter-base cutoff current V_{EB} = 3 V, I_C = 0	I_{EBO}	-	-	10	nA
DC current gain[1)] I_C = 100 µA, V_{CE} = 10 V I_C = 1 mA, V_{CE} = 10 V I_C = 10 mA, V_{CE} = 10 V I_C = 150 mA, V_{CE} = 1 V I_C = 150 mA, V_{CE} = 10 V I_C = 500 mA, V_{CE} = 10 V	h_{FE}	 35 50 75 50 100 40	 - - - - - -	 - - - - 300 -	-
Collector-emitter saturation voltage[1)] I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA	V_{CEsat}	 - -	 - -	 0.3 1	V
Base emitter saturation voltage[1)] I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA	V_{BEsat}	 0.6 -	 - -	 1.2 2	

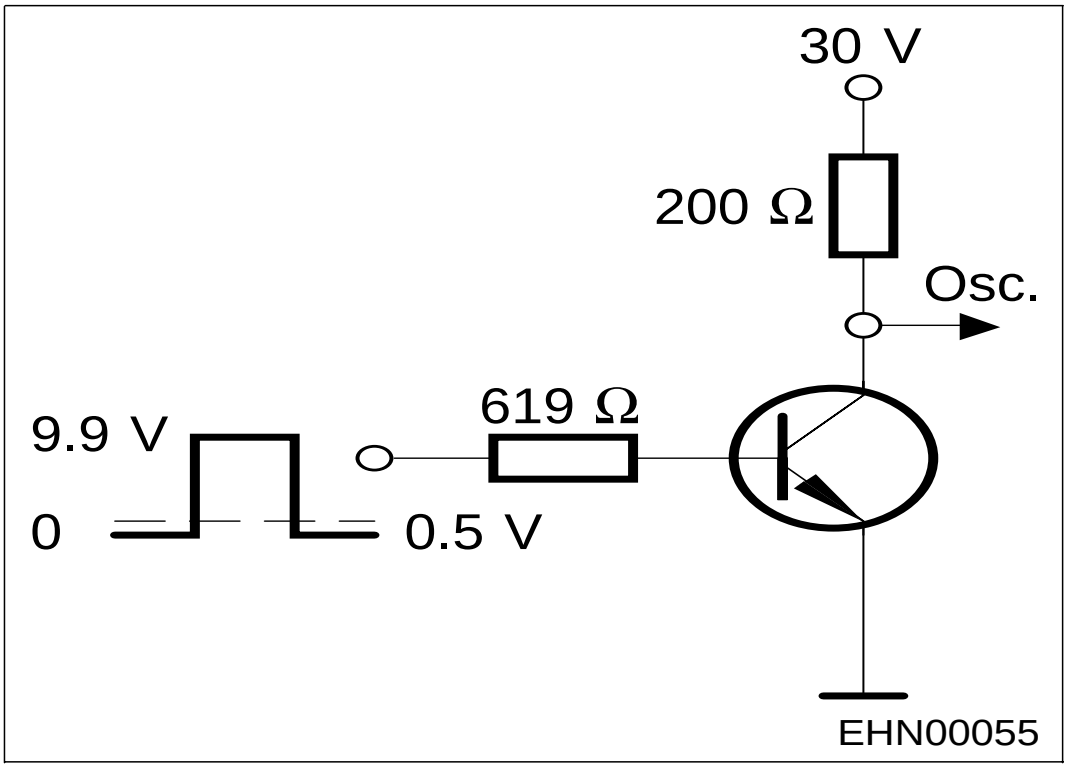
[1]Pulse test: t < 300µs; D < 2%

Electrical Characteristics at T_A = 25°C, unless otherwise specified

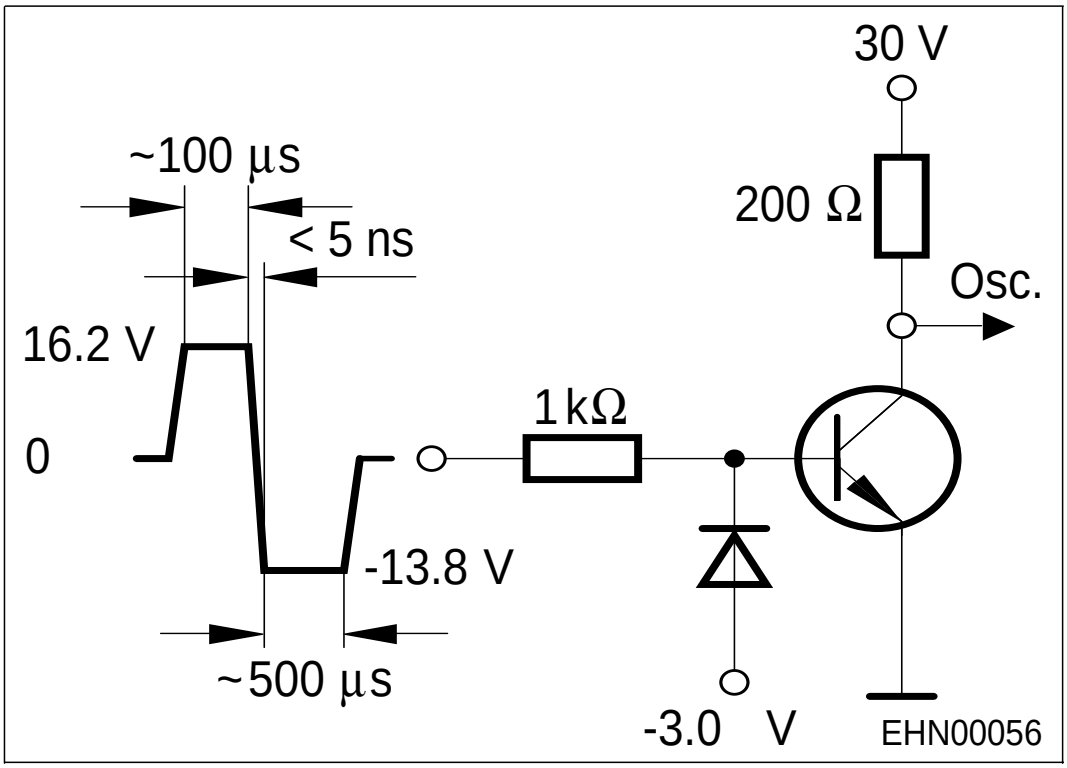
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics					
Transition frequency I_C = 20 mA, V_{CE} = 20 V, f = 100 MHz	f_T	300	-	-	MHz
Collector-base capacitance V_{CB} = 10 V, f = 1 MHz	C_{cb}	-	2.5	5	pF
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz	C_{eb}	-	-	35	
Short-circuit input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

Test circuit

Delay and rise time



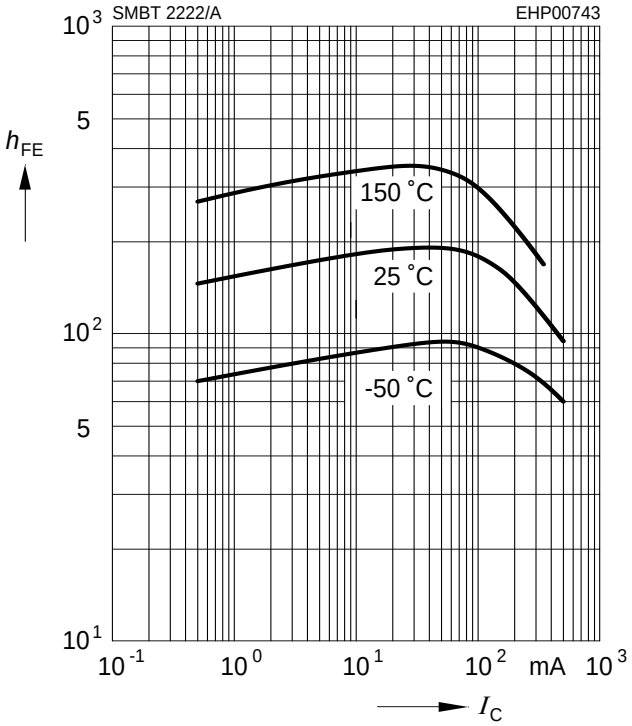
Storage and fall time



Oscillograph: R > 100Ω, C < 12pF, t_r < 5ns

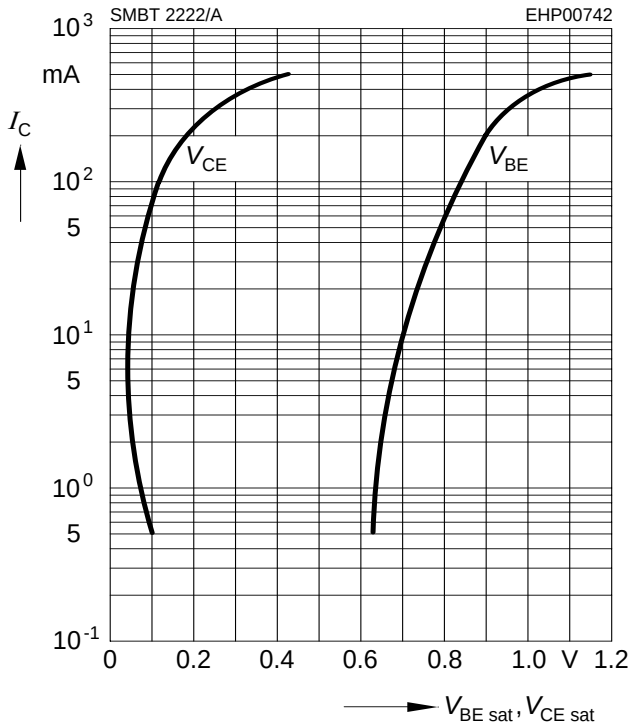
DC current gain $h_{FE} = f(I_C)$

V_{CE} = 10 V



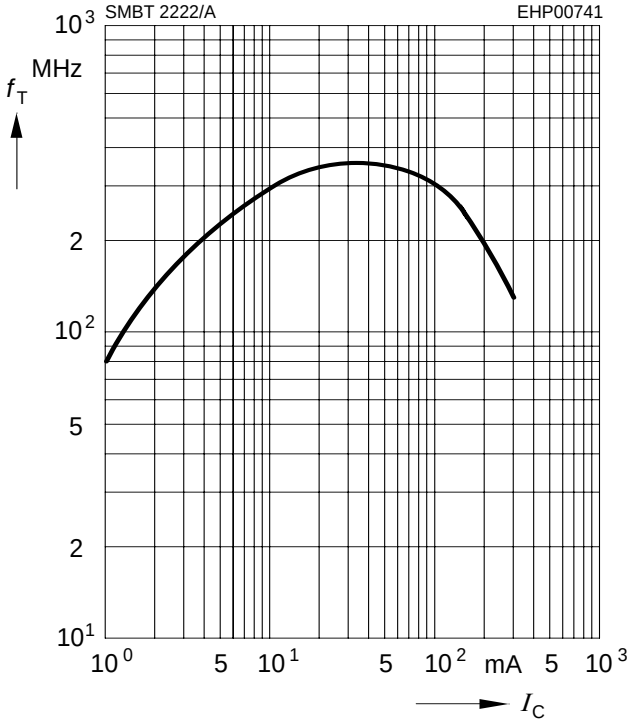
Saturation voltage $I_C = f(V_{BEsat}; V_{CEsat})$

h_{FE} = 10



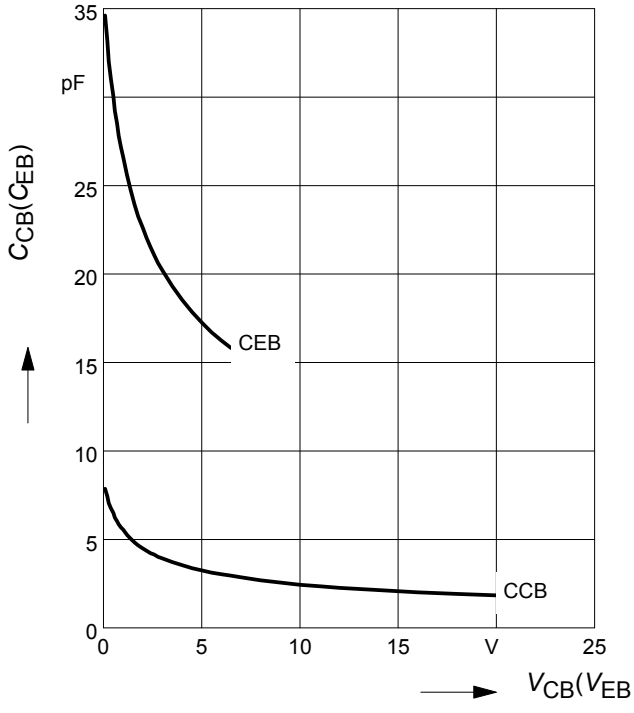
Transition frequency $f_T = f(I_C)$

V_{CE} = 20 V

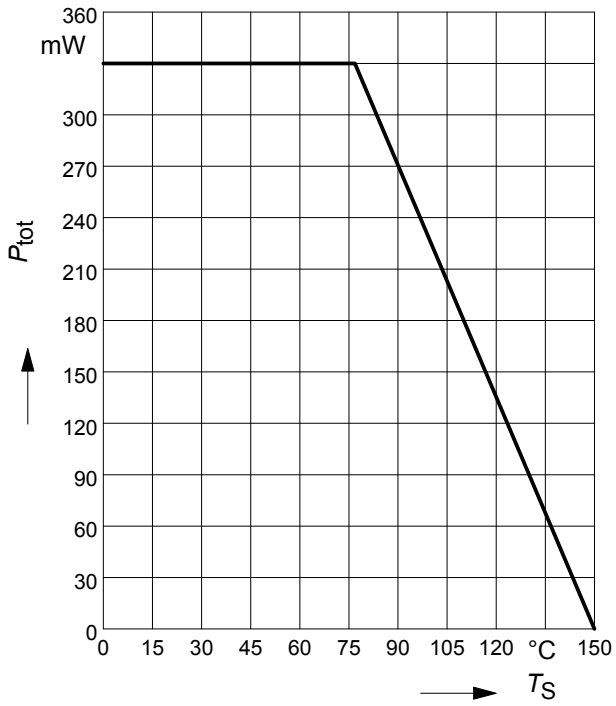


Collector-base capacitance $C_{cb} = f(V_{CB})$

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

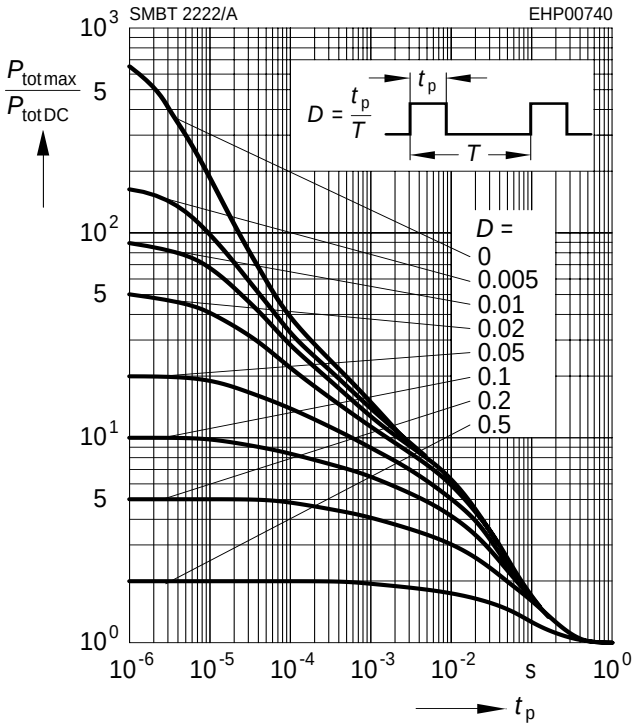


Total power dissipation $P_{tot} = f(T_S)$



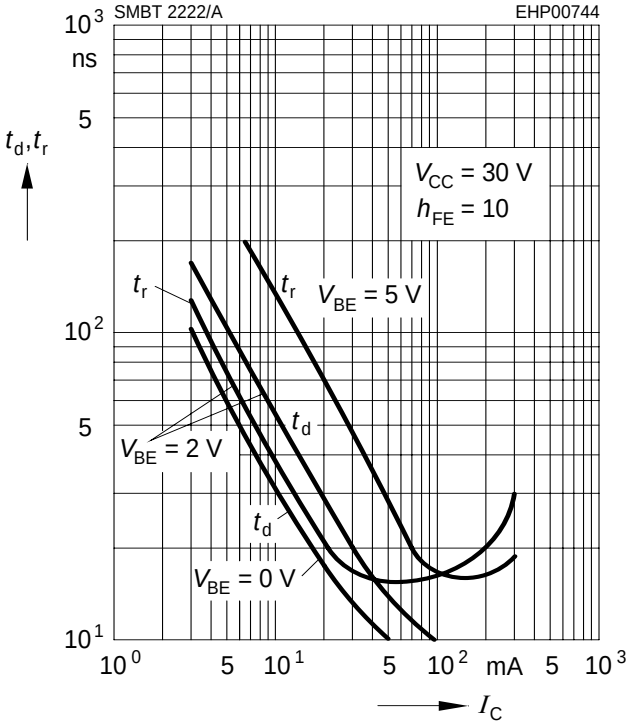
Permissible Pulse Load

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



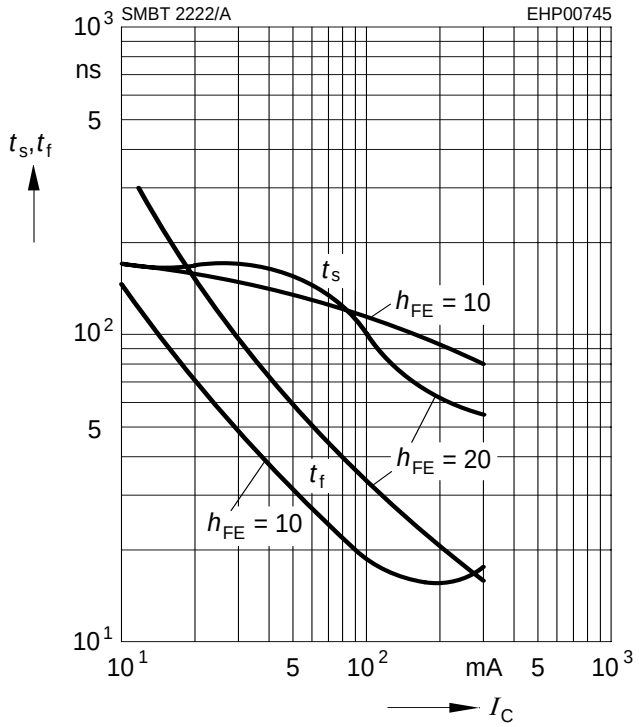
Delay time $t_d = f(I_C)$

Rise time $t_r = f(I_C)$

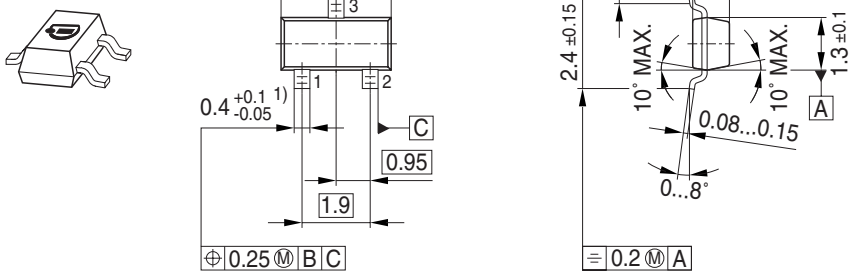


Storage time $t_{stg} = f(I_C)$

Fall time $t_f = f(I_C)$

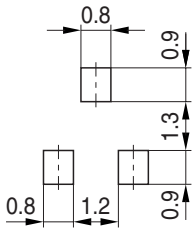


Package Outline

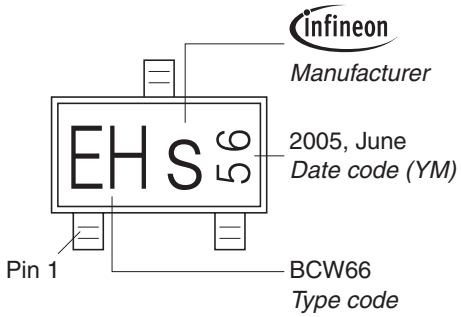


1) Lead width can be 0.6 max. in dambar area

Foot Print

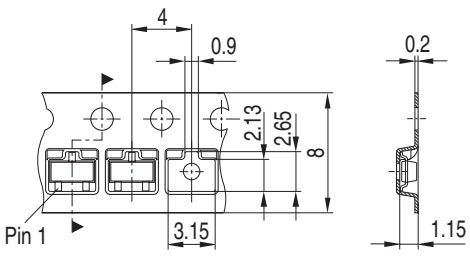


Marking Layout (Example)



Standard Packing

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



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