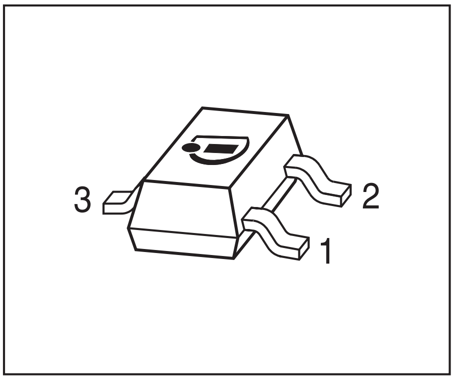
NPN Silicon Switching Transistor

- High DC current gain: 0.1 mA to 500 mA
- Low collector-emitter saturation voltage
- Complementary type: SMBT2907AW (PNP)



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 Thermal Resistance

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	I_{CBO}				µA
V_{CB} = 60 V, I_E = 0		-	-	0.01	
V_{CB} = 60 V, I_E = 0 , T_A = 150 °C		-	-	10	
Emitter-base cutoff current V_{EB} = 3 V, I_C = 0	I_{EBO}	-	-	10	nA
DC current gain[1]	h_{FE}				-
I_C = 100 µA, V_{CE} = 10 V		35	-	-	
I_C = 1 mA, V_{CE} = 10 V		50	-	-	
I_C = 10 mA, V_{CE} = 10 V		75	-	-	
I_C = 150 mA, V_{CE} = 1 V		50	-	-	
I_C = 150 mA, V_{CE} = 10 V		100	-	300	
I_C = 500 mA, V_{CE} = 10 V		40	-	-	
Collector-emitter saturation voltage[1]	V_{CEsat}				V
I_C = 150 mA, I_B = 15 mA		-	-	0.3	
I_C = 500 mA, I_B = 50 mA		-	-	1	
Base emitter saturation voltage[1]	V_{BEsat}				
I_C = 150 mA, I_B = 15 mA		0.6	-	1.2	
I_C = 500 mA, I_B = 50 mA		-	-	2	

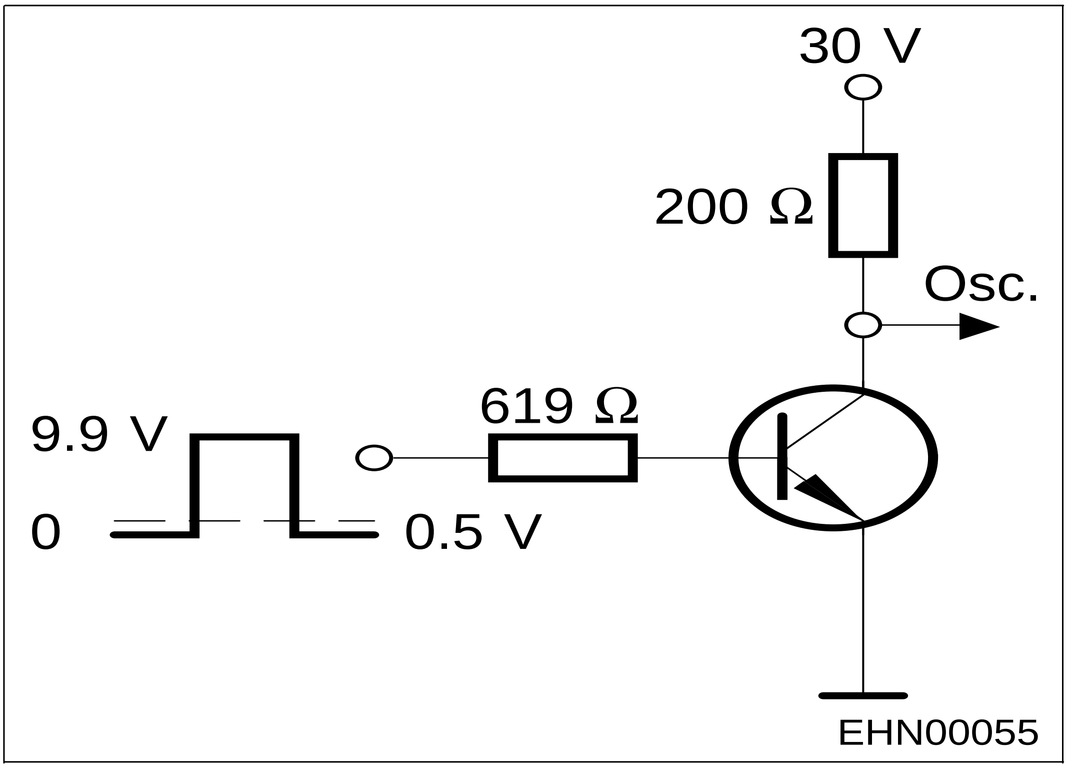
[1] Pulse test: t < 300µs; D < 2%

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

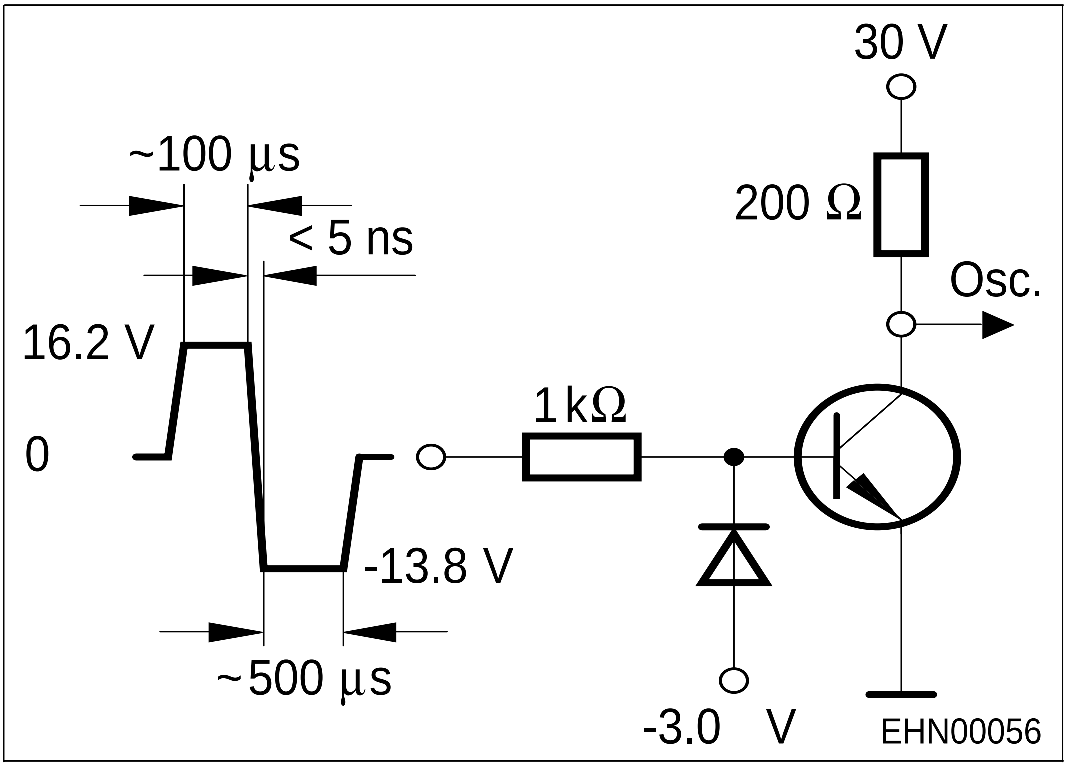
Parameter	**Symbol**	**Values**			**Unit**
		min.	**typ.**	**max.**	
AC Characteristics					
Transition frequency	f_T	300	-	-	MHz
I_C = 20 mA, V_{CE} = 20 V, f = 100 MHz					
Collector-base capacitance	C_{cb}	-	2.5	5	pF
V_{CB} = 10 V, f = 1 MHz					
Emitter-base capacitance	C_{eb}	-	-	35	
V_{EB} = 0.5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

Test circuit

Delay and rise time



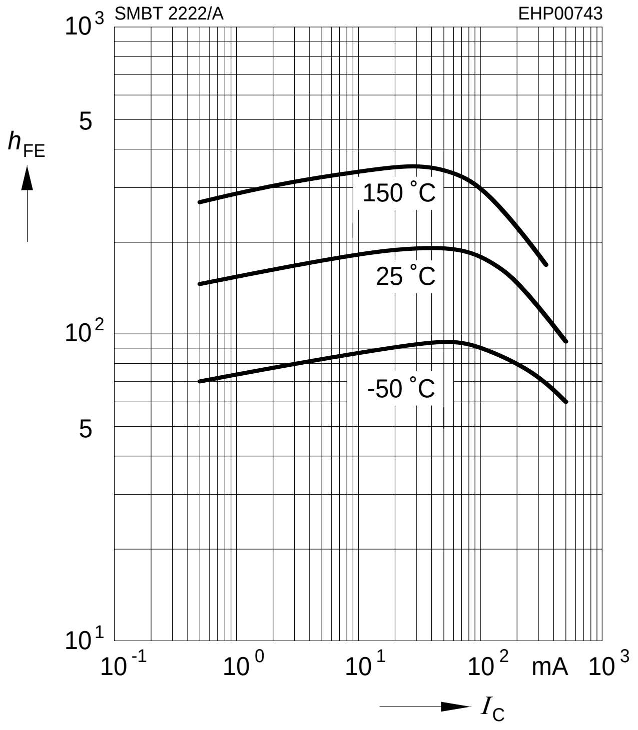
Storage and fall time



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

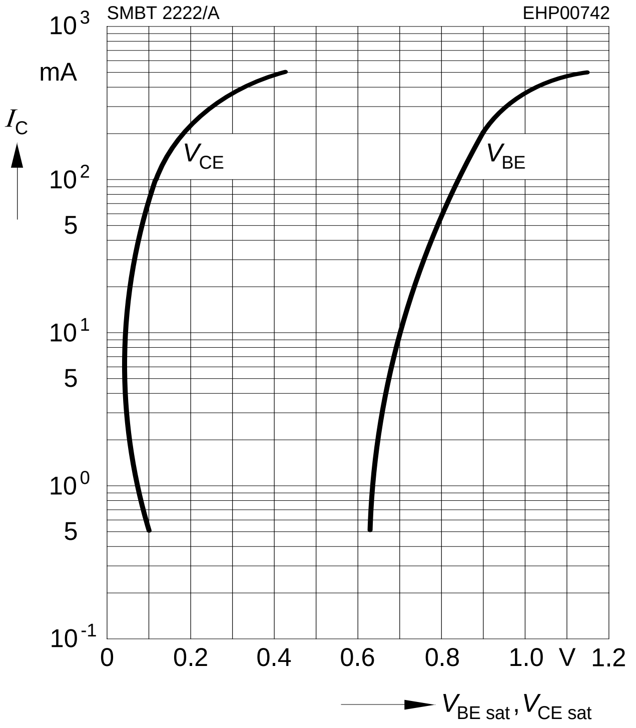
DC current gain h_{FE} = $f(I_C)$

V_{CE} = 10 V



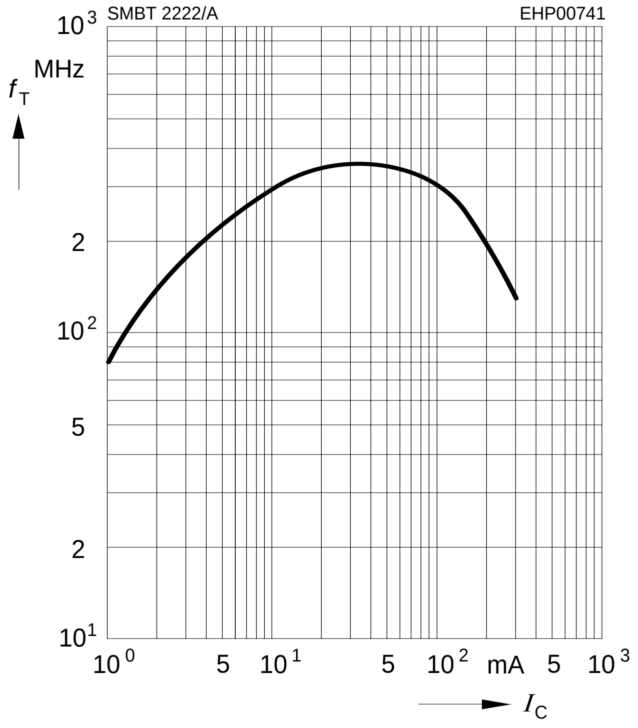
Saturation voltage I_C = $f(V_{BEsat}$; $V_{CEsat})$

h_{FE} = 10

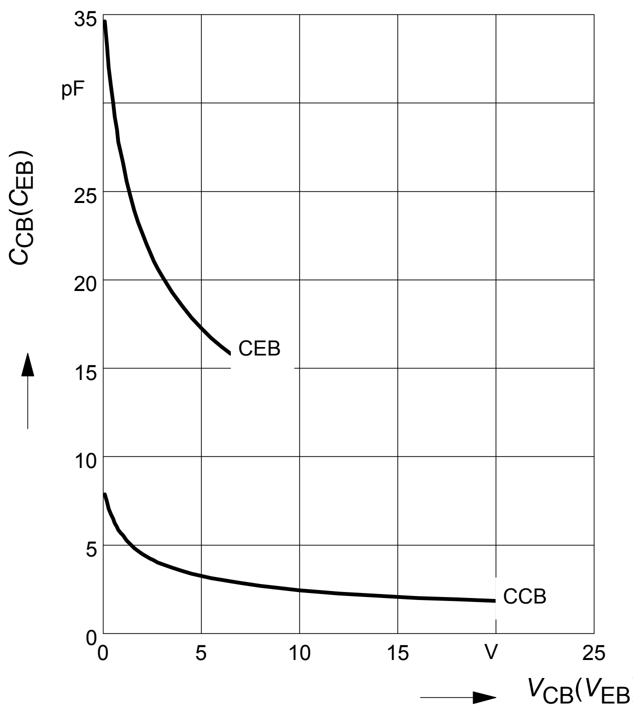


Transition frequency f_T = $f(I_C)$

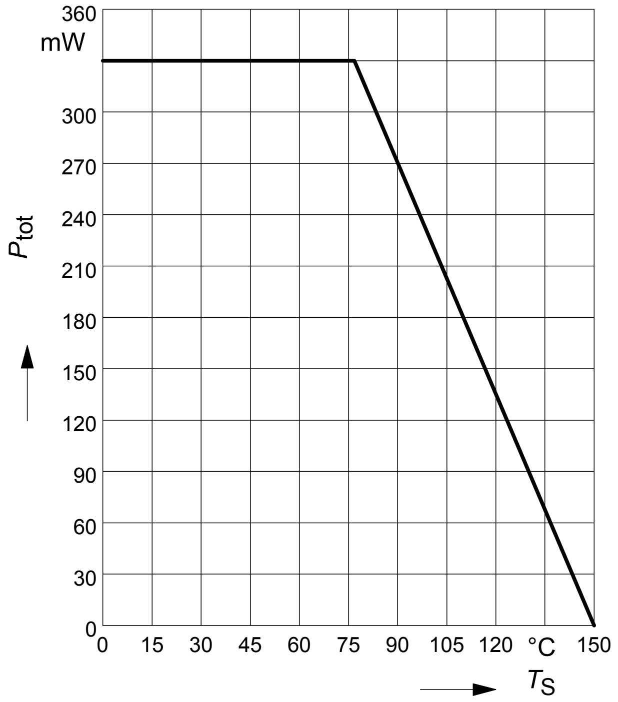
V_{CE} = 20 V



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

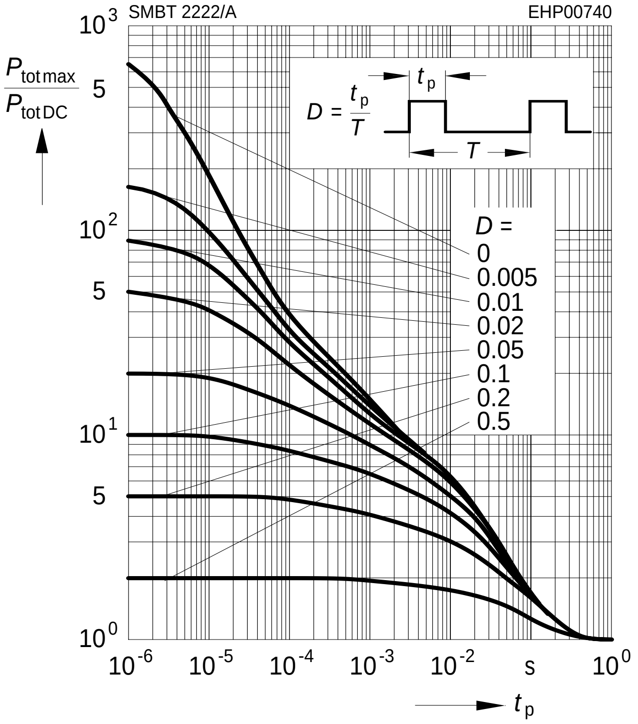


Total power dissipation $P_{tot} = f(T_S)$

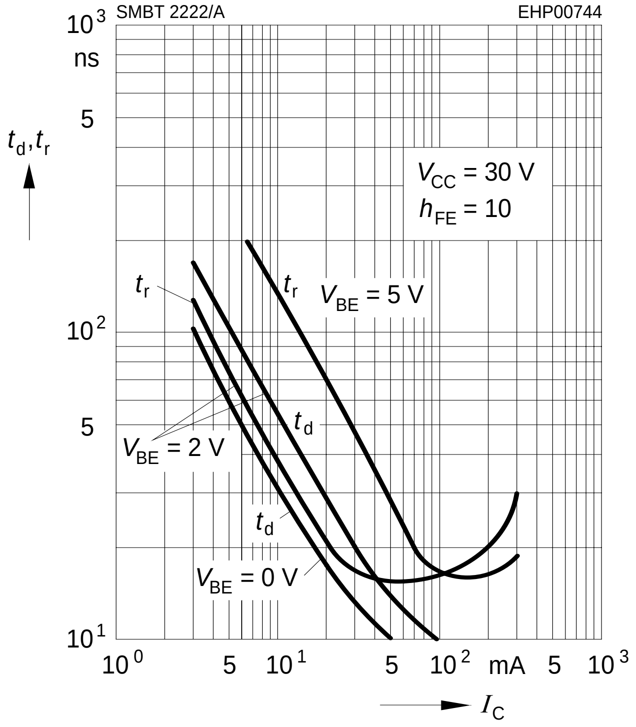


Permissible Pulse Load

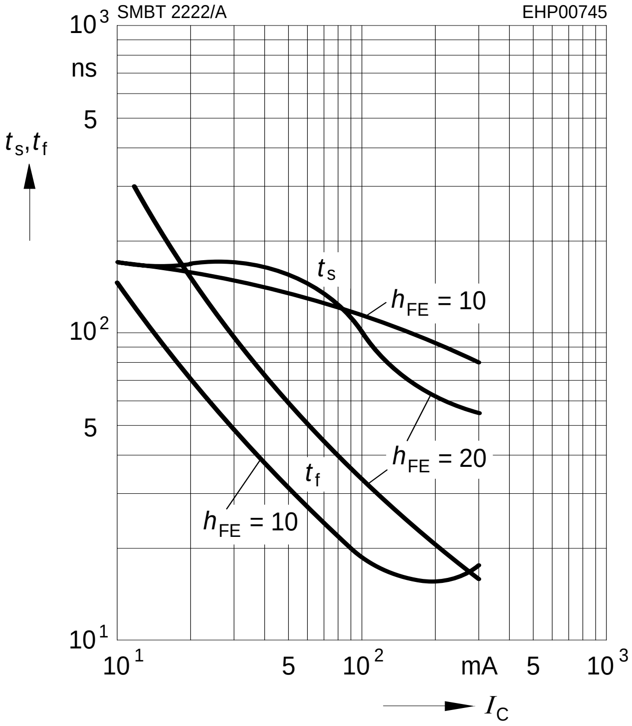
$P_{totmax}/P_{totDC} = f(t_p)$



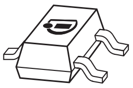
Delay time $t_d = f(I_C)$
Rise time $t_r = f(I_C)$

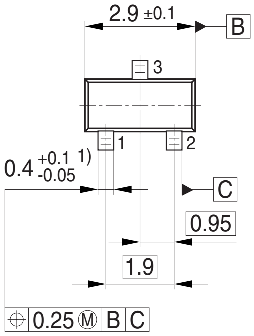


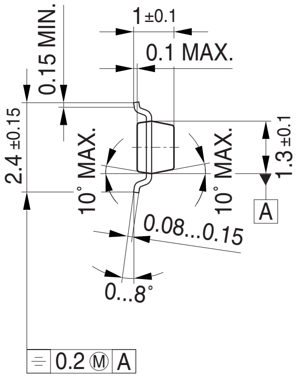
Storage time $t_{stg} = f(I_C)$
Fall time $t_f = f(I_C)$



Package Outline

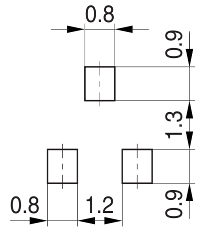




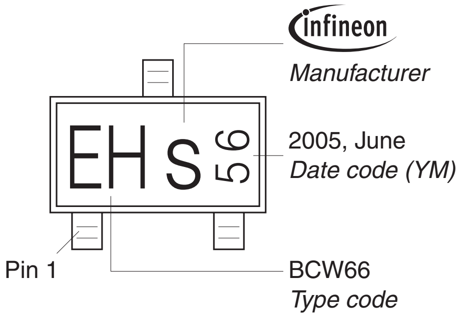


1) Lead width can be 0.6 max. in dambar area

Foot Print

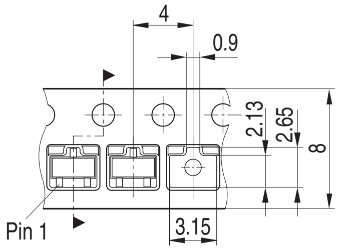


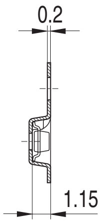
Marking Layout (Example)



Standard Packing

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





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