

PNP Silicon Switching Transistors

- High DC current gain: 0.1 mA to 100 mA
- Low collector-emitter saturation voltage
- For SMBT3906S and SMBT3906U:
Two (galvanic) internal isolated transistor with good matching in one package
- Complementary types:
SMBT3904...MMBT3904 (NPN)
- SMBT3906S/ U: for orientation in reel
see package information below
- Pb-free (RoHS compliant) package
- Qualified according AEC Q101



Type	Marking	Pin Configuration						Package
SMBT3906/ MMBT3906	s2A	1=B	2=E	3=C	-	-	-	SOT23
SMBT3906S	s2A	1=E1	2=B1	3=C2	4=E2	5=B2	6=C1	SOT363
SMBT3906U	s2A	1=E1	2=B1	3=C2	4=E2	5=B2	6=C1	SC74

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	40	V
Collector-base voltage	V_{CBO}	40	
Emitter-base voltage	V_{EBO}	6	
Collector current	I_C	200	mA
Total power dissipation-	P_{tot}		mW
$T_S \leq 71^\circ\text{C}$, SOT23, MMBT3906		330	
$T_S \leq 115^\circ\text{C}$, SOT363, MMBT3906S		250	
$T_S \leq 107^\circ\text{C}$, SC74, MMBT3906U		330	
Junction temperature	T_j	150	$^\circ\text{C}$
Storage temperature	T_{stg}	-65 ... 150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point ¹⁾ SMBT3906/ MMBT3906	R_{thJS}	≤ 240	mW
SMBT3906S		≤ 140	
SMBT3906U		≤ 130	

¹For 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.	

DC Characteristics

Collector-emitter breakdown voltage $I_C = 1 \text{ mA}, I_B = 0$	$V_{(BR)CEO}$	40	-	-	V
Collector-base breakdown voltage $I_C = 10 \mu\text{A}, I_E = 0$	$V_{(BR)CBO}$	40	-	-	
Emitter-base breakdown voltage $I_E = 10 \mu\text{A}, I_C = 0$	$V_{(BR)EBO}$	6	-	-	
Collector-base cutoff current $V_{CB} = 30 \text{ V}, I_E = 0$	I_{CBO}	-	-	50	nA
DC current gain ¹⁾ $I_C = 100 \mu\text{A}, V_{CE} = 1 \text{ V}$ $I_C = 1 \text{ mA}, V_{CE} = 1 \text{ V}$ $I_C = 10 \text{ mA}, V_{CE} = 1 \text{ V}$ $I_C = 50 \text{ mA}, V_{CE} = 1 \text{ V}$ $I_C = 100 \text{ mA}, V_{CE} = 1 \text{ V}$	h_{FE}	60 80 100 60 30	- - - - -	- - 300 - -	-
Collector-emitter saturation voltage ¹⁾ $I_C = 10 \text{ mA}, I_B = 1 \text{ mA}$ $I_C = 50 \text{ mA}, I_B = 5 \text{ mA}$	V_{CEsat}	- -	- -	0.25 0.4	V
Base emitter saturation voltage ¹⁾ $I_C = 10 \text{ mA}, I_B = 1 \text{ mA}$ $I_C = 50 \text{ mA}, I_B = 5 \text{ mA}$	V_{BEsat}	0.65 -	- -	0.85 0.95	

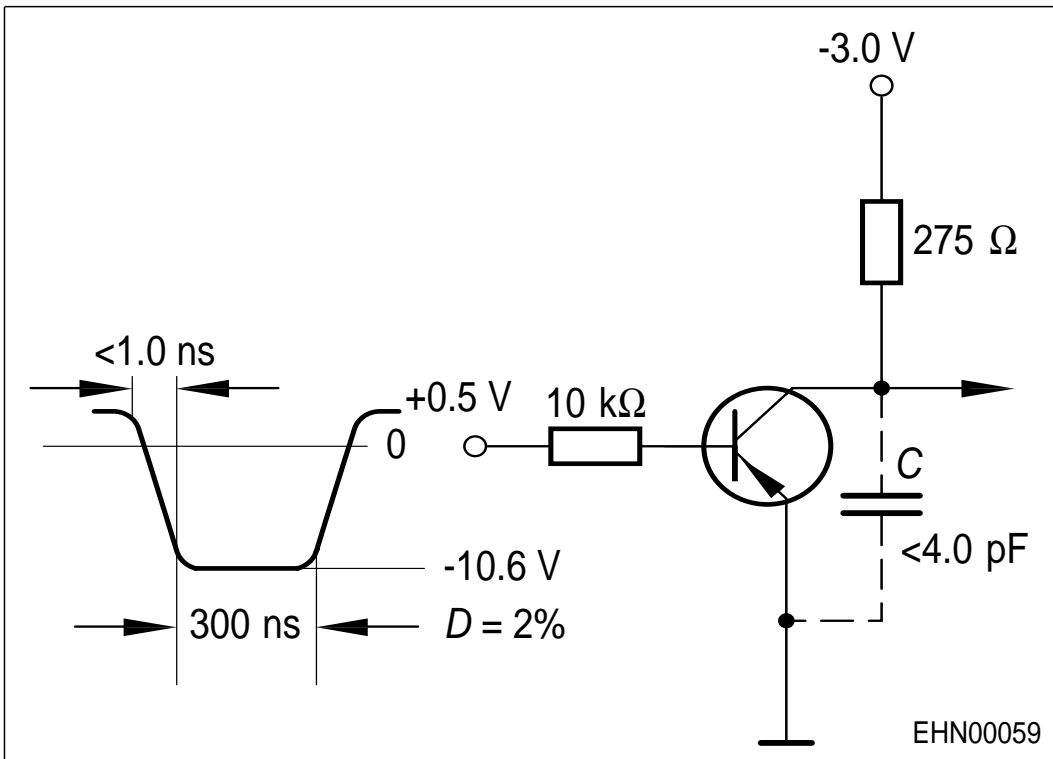
¹Pulse test: $t < 300\mu\text{s}$; $D < 2\%$

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

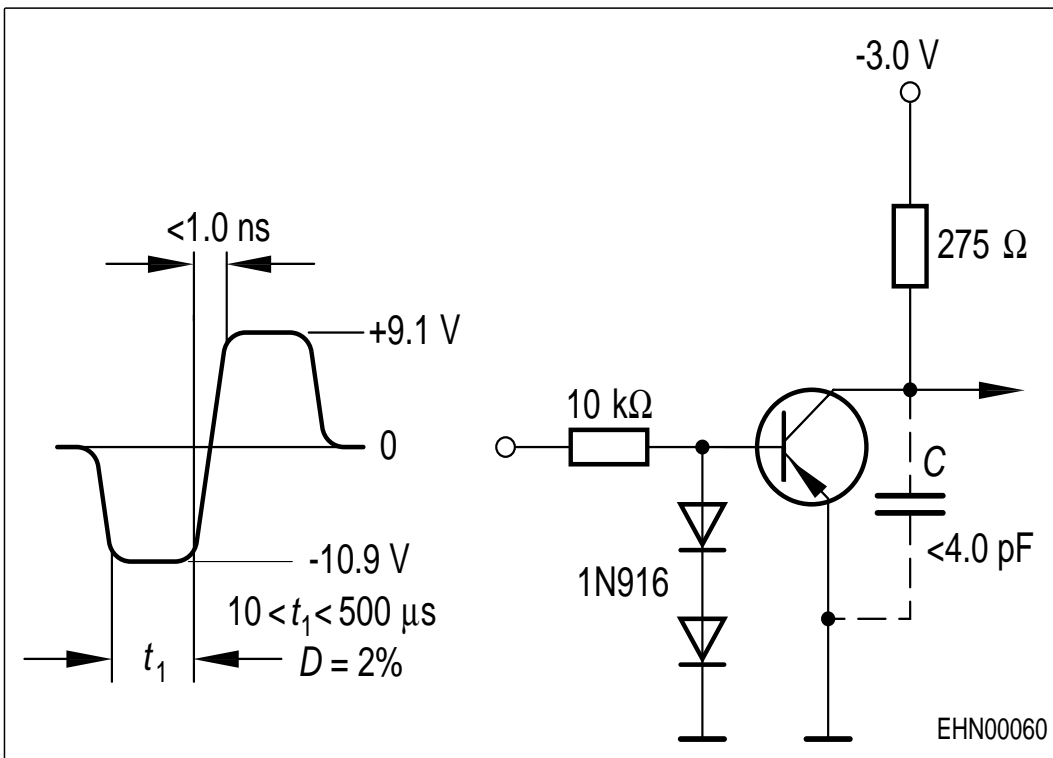
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics					
Transition frequency $I_C = 10\text{ mA}, V_{CE} = 20\text{ V}, f = 100\text{ MHz}$	f_T	250	-	-	MHz
Collector-base capacitance $V_{CB} = 5\text{ V}, f = 1\text{ MHz}$	C_{cb}	-	-	3.5	pF
Emitter-base capacitance $V_{EB} = 0.5\text{ V}, f = 1\text{ MHz}$	C_{eb}	-	-	10	
Delay time $V_{CC} = 3\text{ V}, I_C = 10\text{ mA}, I_{B1} = 1\text{ mA}, V_{BE(off)} = 0.5\text{ V}$	t_d	-	-	35	ns
Rise time $V_{CC} = 3\text{ V}, I_C = 10\text{ mA}, I_{B1} = 1\text{ mA}, V_{BE(off)} = 0.5\text{ V}$	t_r	-	-	35	
Storage time $V_{CC} = 3\text{ V}, I_C = 10\text{ mA}, I_{B1} = I_{B2} = 1\text{ mA}$	t_{stg}	-	-	225	
Fall time $V_{CC} = 3\text{ V}, I_C = 10\text{ mA}, I_{B1} = I_{B2} = 1\text{ mA}$	t_f	-	-	75	
Noise figure $I_C = 100\text{ }\mu\text{A}, V_{CE} = 5\text{ V}, f = 1\text{ kHz}, \Delta f = 200\text{ Hz}, R_S = 1\text{ k}\Omega$	F	-	-	4	dB

Test circuit

Delay and rise time

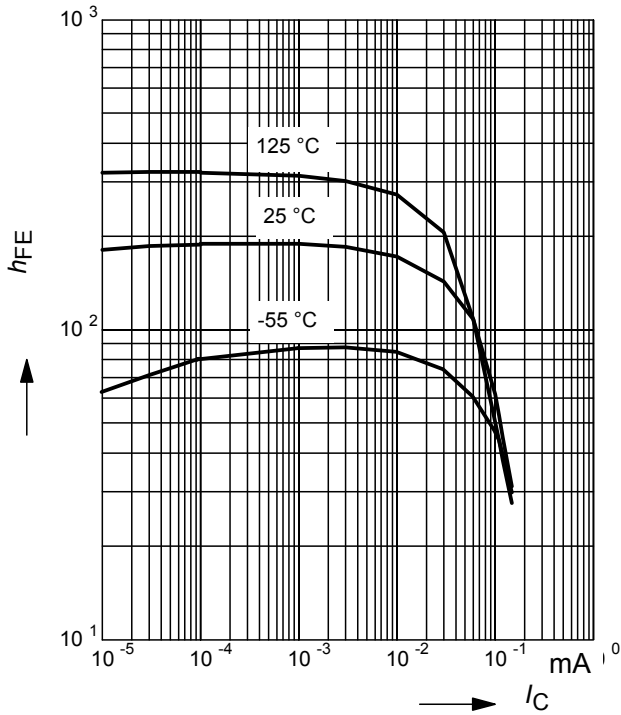


Storage and fall time



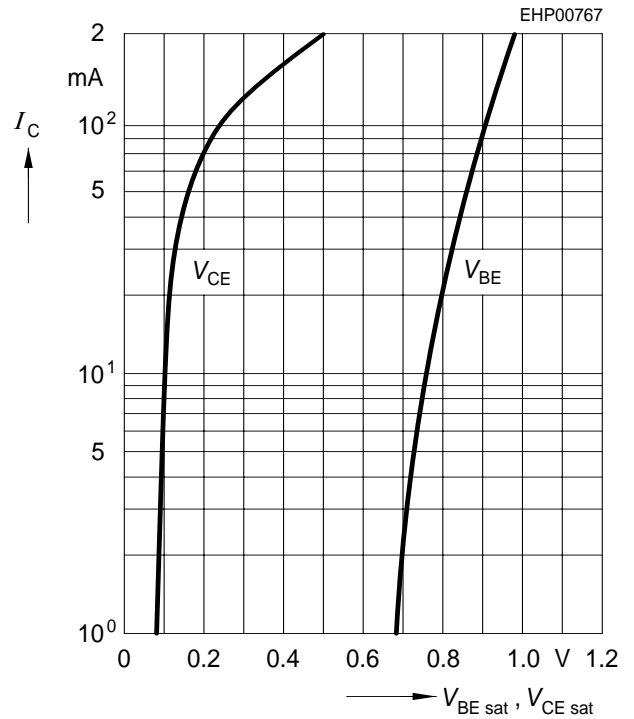
DC current gain $h_{FE} = f(I_C)$

$V_{CE} = 1\text{ V}$



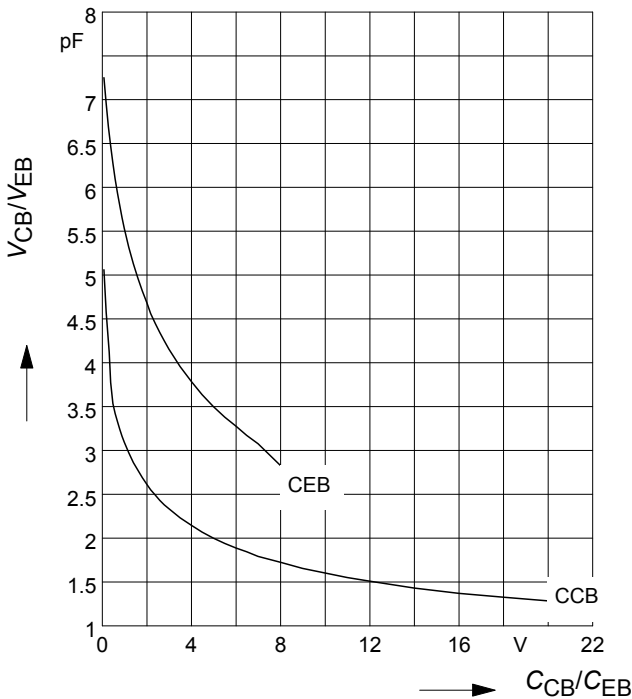
Saturation voltage $I_C = f(V_{BEsat}; V_{CEsat})$

$h_{FE} = 10$



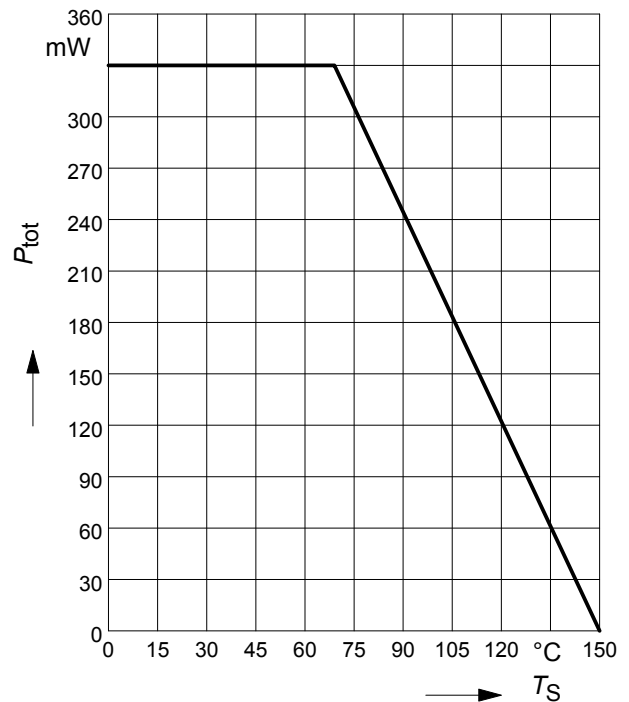
Collector-base capacitance $C_{cb} = f(V_{CB})$

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



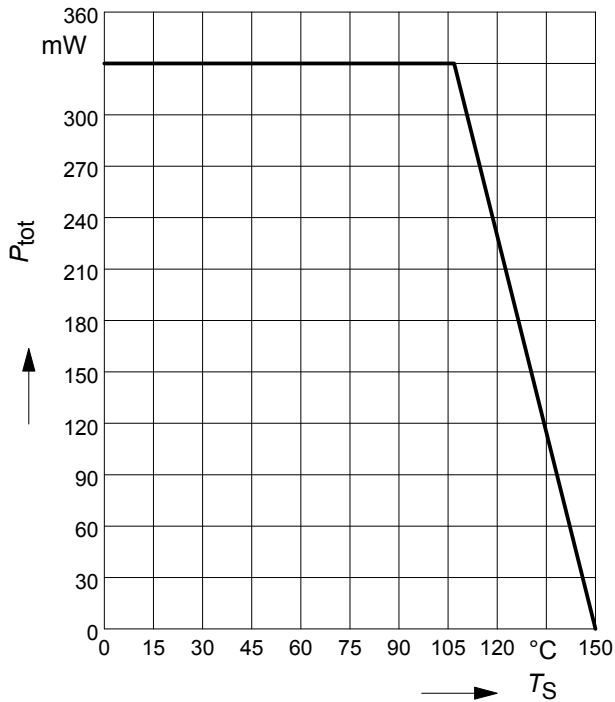
Total power dissipation $P_{tot} = f(T_S)$

SMBT3906



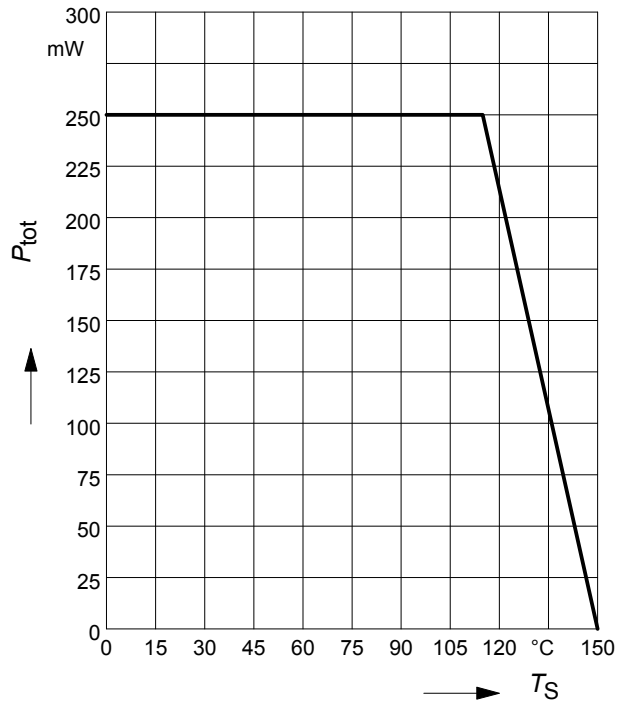
Total power dissipation $P_{tot} = f(T_S)$

SMBT3906U



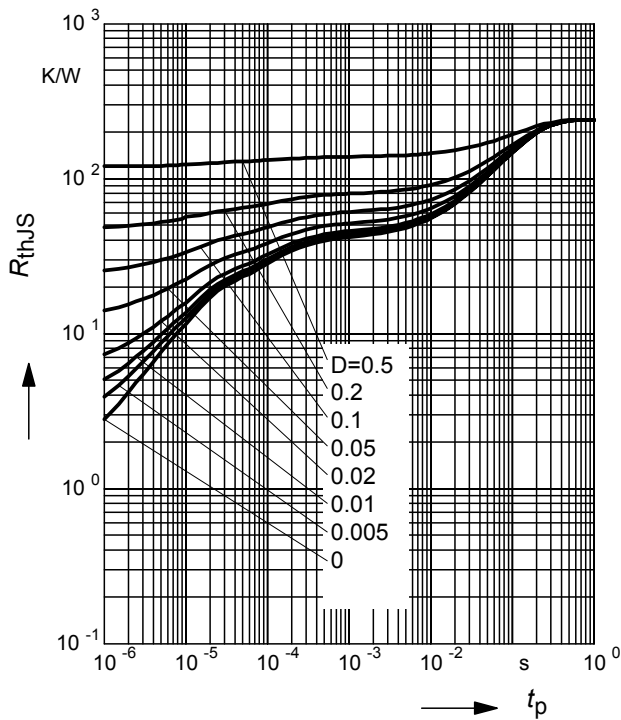
Total power dissipation $P_{tot} = f(T_S)$

SMBT3906S



Permissible Pulse Load $R_{thJS} = f(t_p)$

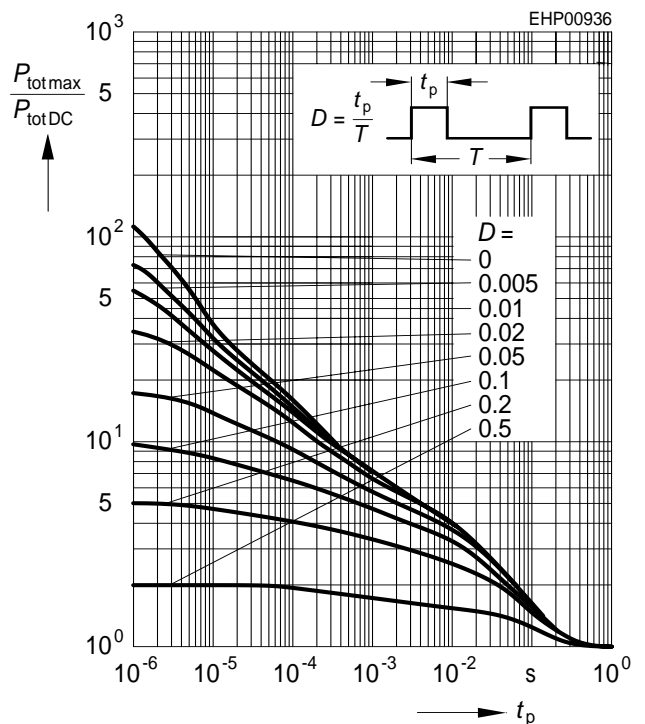
SMBT3906



Permissible Pulse Load

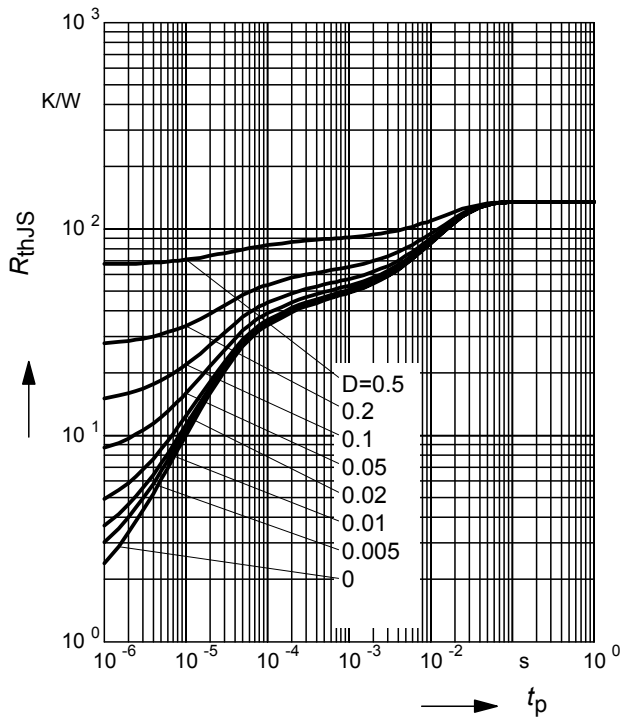
$P_{totmax}/P_{totDC} = f(t_p)$

SMBT3906



Permissible Puls Load $R_{thJS} = f(t_p)$

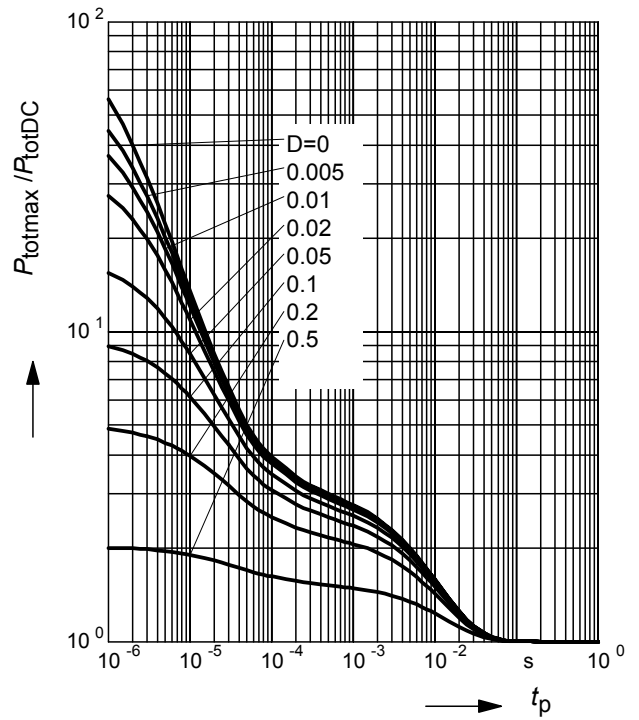
SMBT3906U



Permissible Pulse Load

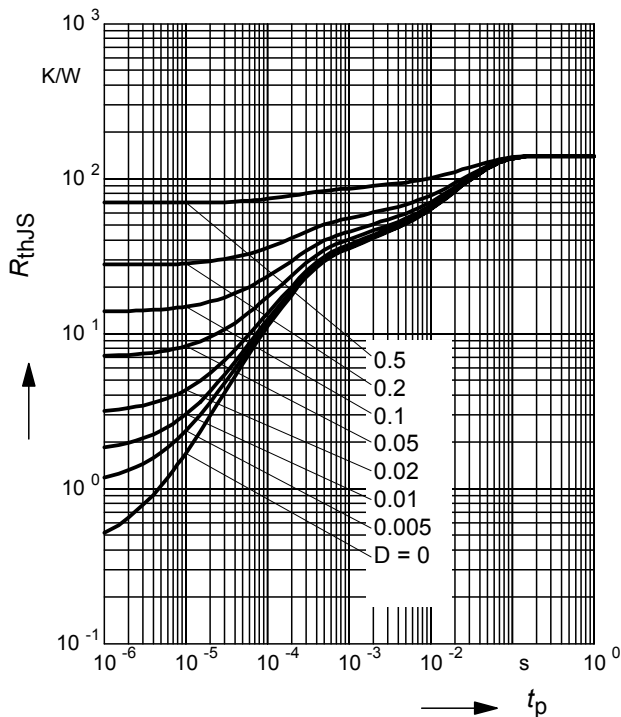
$P_{totmax}/P_{totDC} = f(t_p)$

SMBT3906U



Permissible Pulse Load $R_{thJS} = f(t_p)$

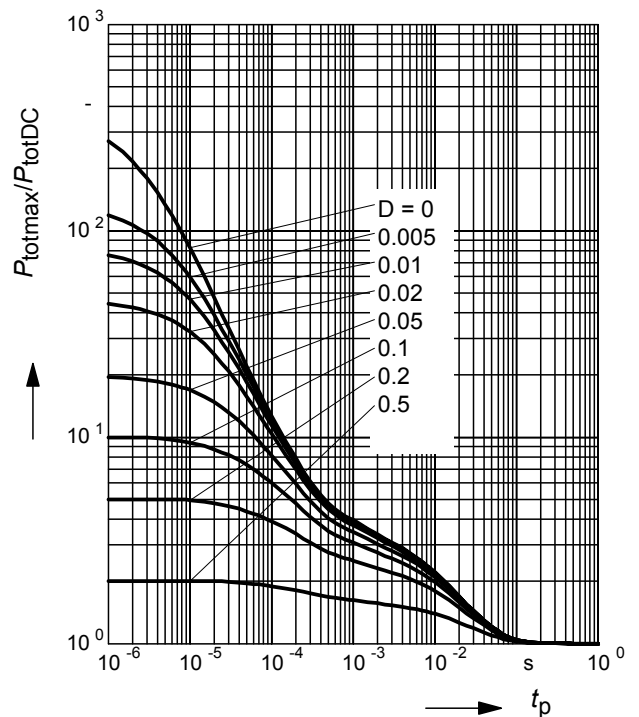
SMBT3906S



Permissible Pulse Load

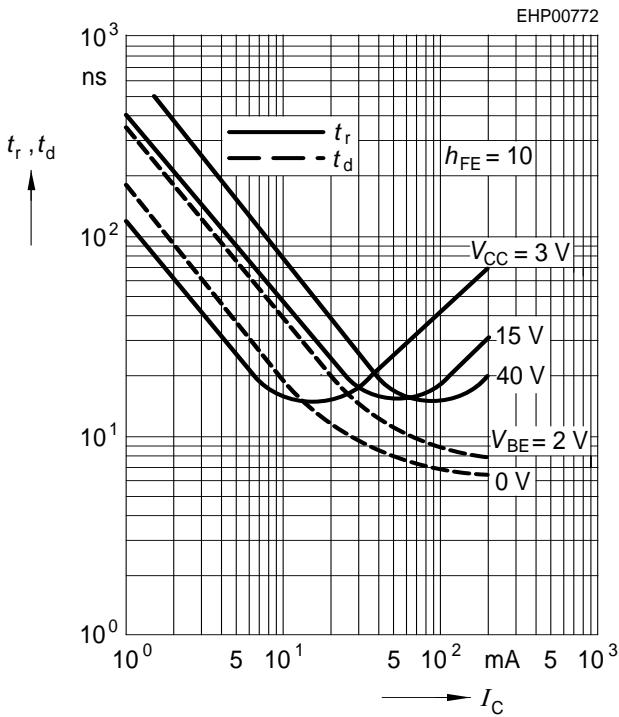
$P_{totmax}/P_{totDC} = f(t_p)$

SMBT3906S

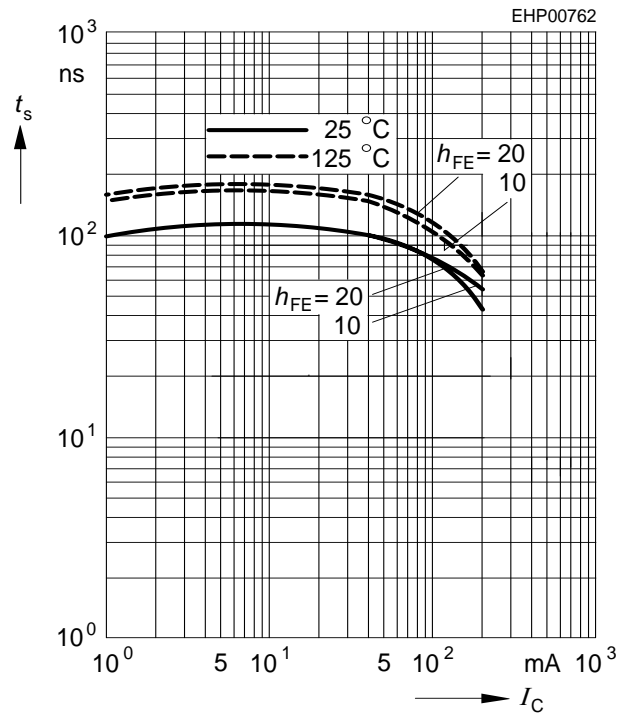


Delay time $t_d = f(I_C)$

Rise time $t_r = f(I_C)$

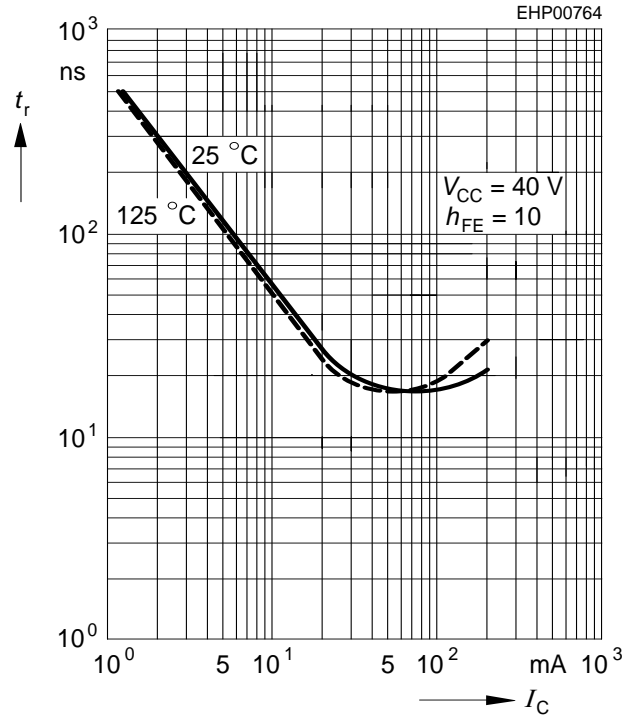
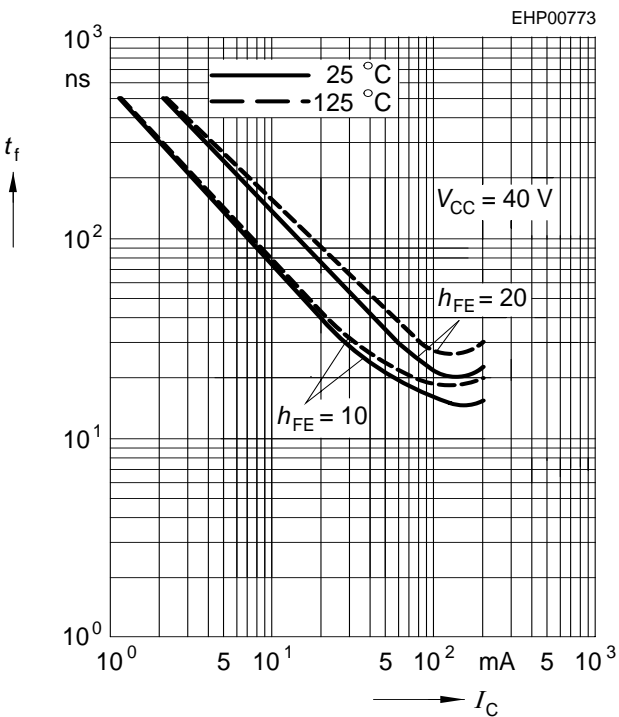


Storage time $t_{stg} = f(I_C)$

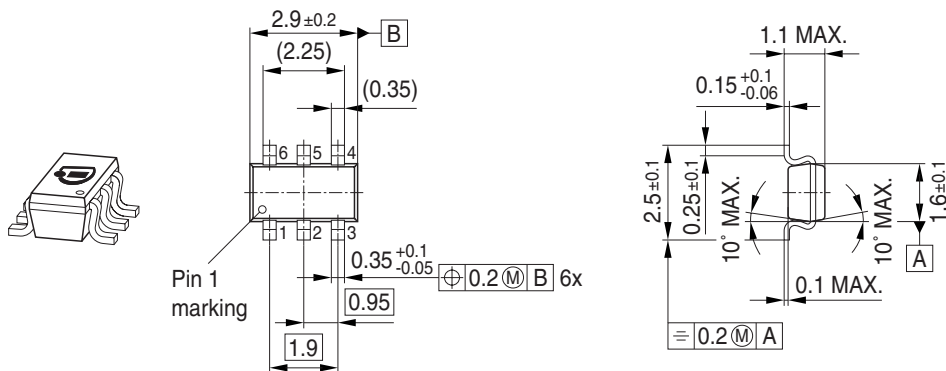


Fall time $t_f = f(I_C)$

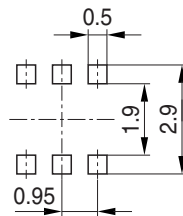
Rise time $t_r = f(I_C)$



Package Outline

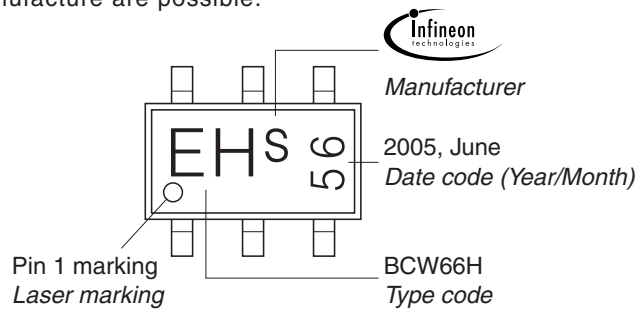


Foot Print



Marking Layout (Example)

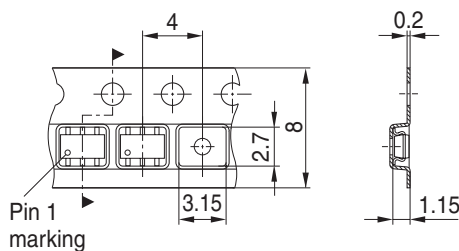
Small variations in positioning of Date code, Type code and Manufacture are possible.



Standard Packing

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

For symmetric types no defined Pin 1 orientation in reel.



Package Outline

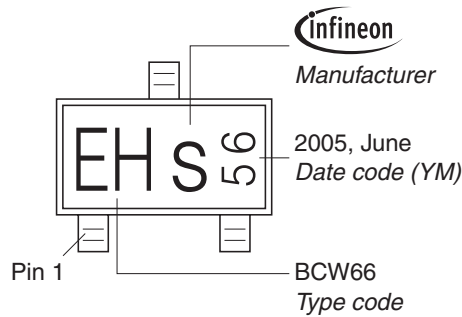


1) Lead width can be 0.6 max. in dambar area

Foot Print

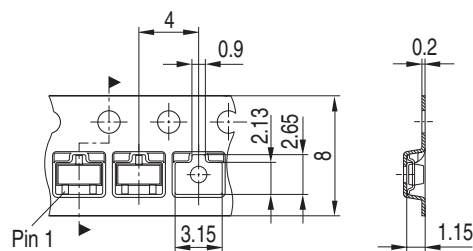


Marking Layout (Example)



Standard Packing

Reel \varnothing 180 mm = 3.000 Pieces/Reel
 Reel \varnothing 330 mm = 10.000 Pieces/Reel



Package Outline

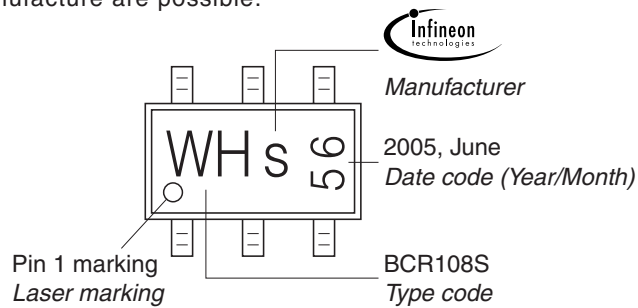


Foot Print



Marking Layout (Example)

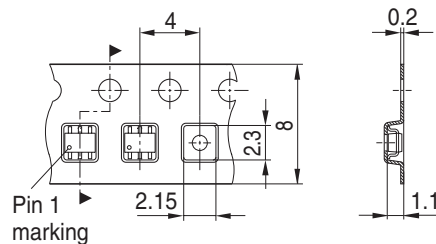
Small variations in positioning of Date code, Type code and Manufacture are possible.



Standard Packing

Reel \varnothing 180 mm = 3.000 Pieces/Reel
 Reel \varnothing 330 mm = 10.000 Pieces/Reel

For symmetric types no defined Pin 1 orientation in reel.



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