

Excellent Integrated System Limited

Stocking Distributor

Click to view price, real time Inventory, Delivery & Lifecycle Information:

[Infineon Technologies](#)
[MMBT 3904 LT1](#)

For any questions, you can email us directly:

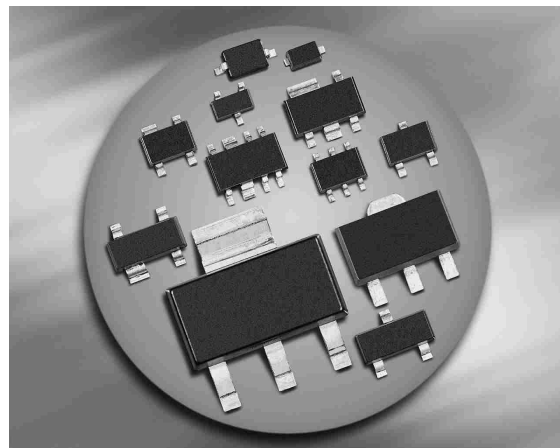
sales@integrated-circuit.com



SMBT3904...MMBT3904

NPN Silicon Switching Transistors

- High DC current gain: 0.1 mA to 100 mA
- Low collector-emitter saturation voltage
- For SMBT3904S:
Two (galvanic) internal isolated transistors with good matching in one package
- Complementary types: SMBT3906... MMBT3906
- SMBT3904S: For orientation in reel
see package information below
- Pb-free (RoHS compliant) package
- Qualified according AEC Q101



Type	Marking	Pin Configuration						Package
SMBT3904/MMBT3904	s1A	1=B	2=E	3=C	-	-	-	SOT23
SMBT3904S	s1A	1=E1	2=B1	3=C2	4=E2	5=B2	6=C1	SOT363

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	40	V
Collector-base voltage	V_{CBO}	60	
Emitter-base voltage	V_{EBO}	6	
Collector current	I_C	200	mA
Total power dissipation- $T_S \leq 71^\circ\text{C}$, SOT23, SMBT3904	P_{tot}	330	mW
$T_S \leq 115^\circ\text{C}$, SOT363, SMBT3904S		250	
Junction temperature	T_j	150	$^\circ\text{C}$
Storage temperature	T_{stg}	-65 ... 150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point ¹⁾	R_{thJS}		K/W
SMBT3904/MMBT3904		≤ 240	
SMBT3904S		≤ 140	

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



SMBT3904...MMBT3904

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 $I_C = 10\text{ }\mu\text{A}, I_E = 0$	$V_{(BR)CBO}$	60	-	-	
Emitter-base breakdown voltage $I_E = 10\text{ }\mu\text{A}, I_C = 0$	$V_{(BR)EBO}$	6	-	-	
Collector-base cutoff current $V_{CB} = 30\text{ V}, I_E = 0$	I_{CBO}	-	-	50	nA
DC current gain ¹⁾ $I_C = 100\text{ }\mu\text{A}, V_{CE} = 1\text{ V}$ $I_C = 1\text{ mA}, V_{CE} = 1\text{ V}$ $I_C = 10\text{ mA}, V_{CE} = 1\text{ V}$ $I_C = 50\text{ mA}, V_{CE} = 1\text{ V}$ $I_C = 100\text{ mA}, V_{CE} = 1\text{ V}$	h_{FE}	40 70 100 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}	- -	- -	0.2 0.3	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	

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



SMBT3904...MMBT3904

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

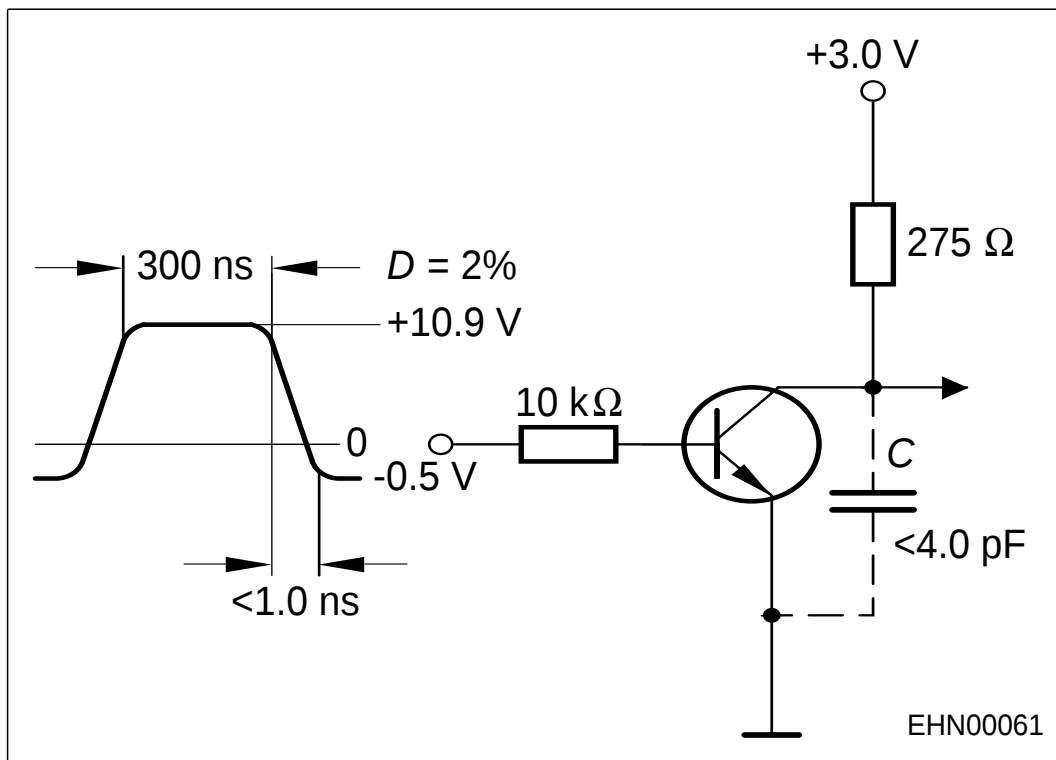
Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics					
Transition frequency $I_C = 10\text{ mA}$, $V_{CE} = 20\text{ V}$, $f = 100\text{ MHz}$	f_T	300	-	-	MHz
Collector-base capacitance $V_{CB} = 5\text{ V}$, $f = 1\text{ MHz}$	C_{cb}	-	-	3.5	pF
Emitter-base capacitance $V_{EB} = 0.5\text{ V}$, $f = 1\text{ MHz}$	C_{eb}	-	-	8	
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}	-	-	200	
Fall time $V_{CC} = 3\text{ V}$, $I_C = 10\text{ mA}$, $I_{B1} = I_{B2} = 1\text{ mA}$	t_f	-	-	50	
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	-	-	5	dB



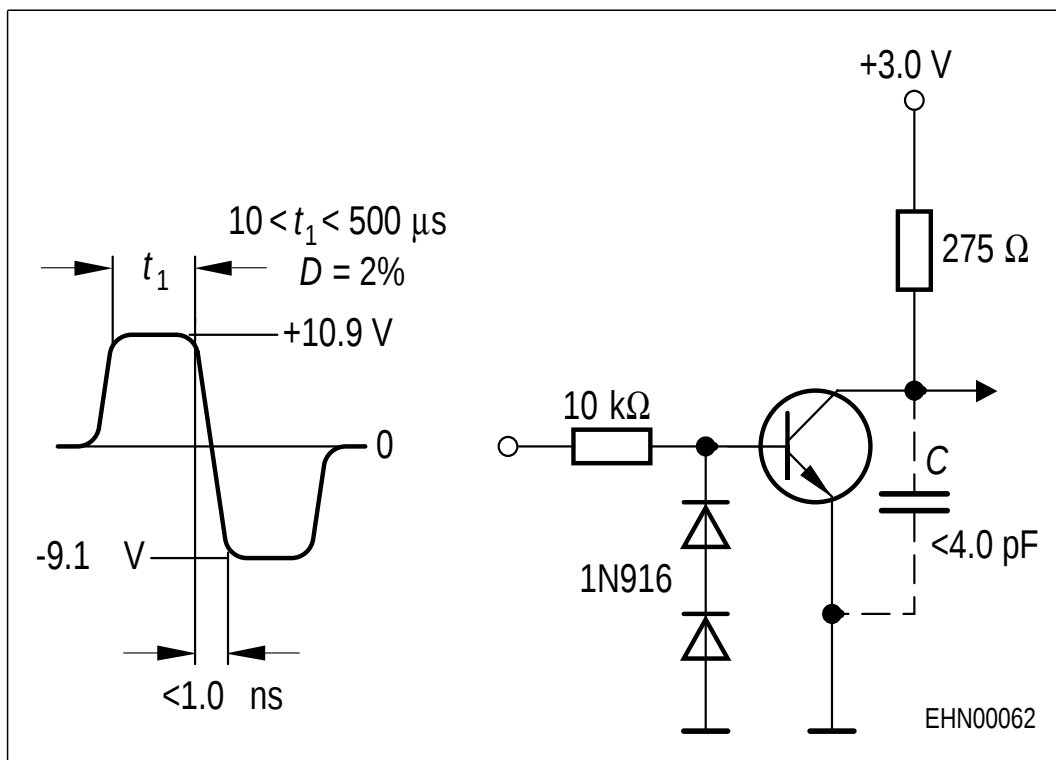
SMBT3904...MMBT3904

Test circuits

Delay and rise time



Storage and fall time

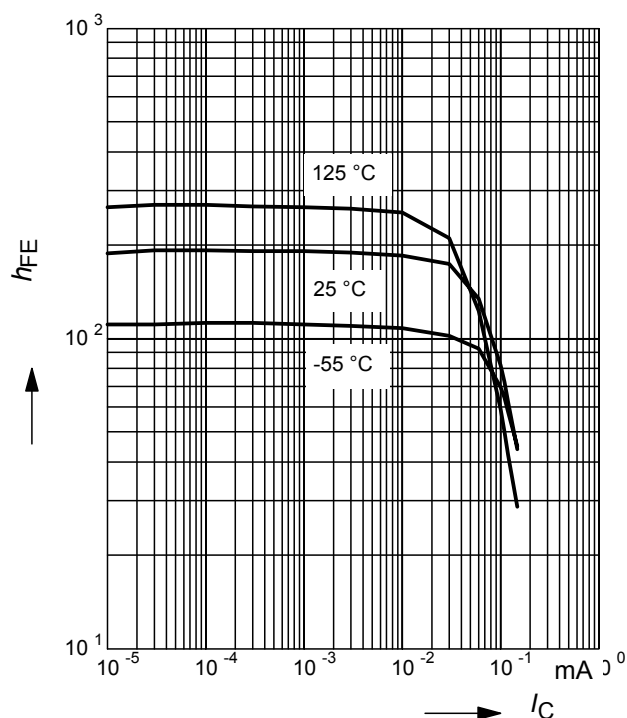




SMBT3904...MMBT3904

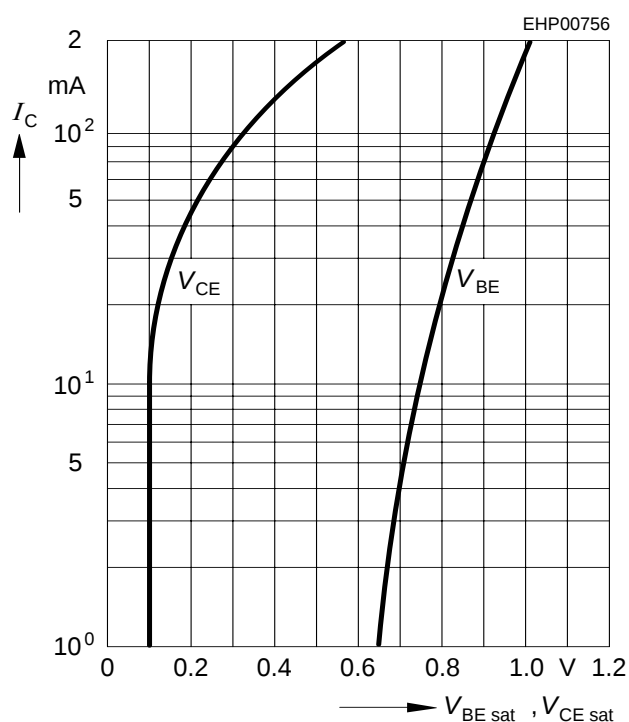
DC current gain $h_{FE} = f(I_C)$

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



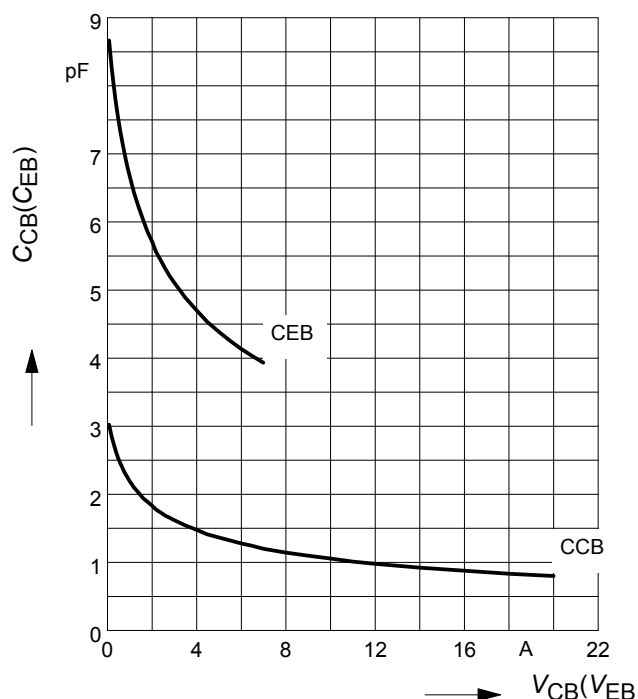
Saturation voltage $I_C = f(V_{BEsat}; V_{CEsat})$

$h_{FE} = 10$



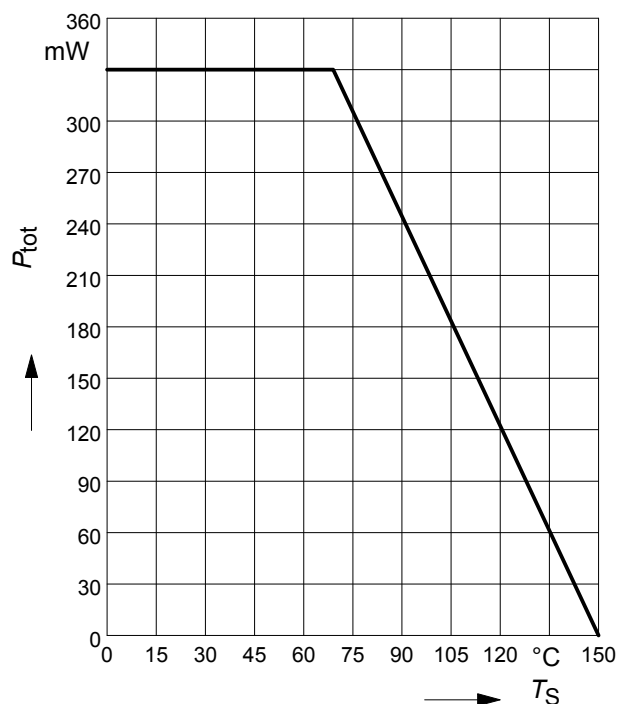
Collector-base capacitance $C_{cb} = f(V_{CB})$

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



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

SMBT3904/MMBT3904

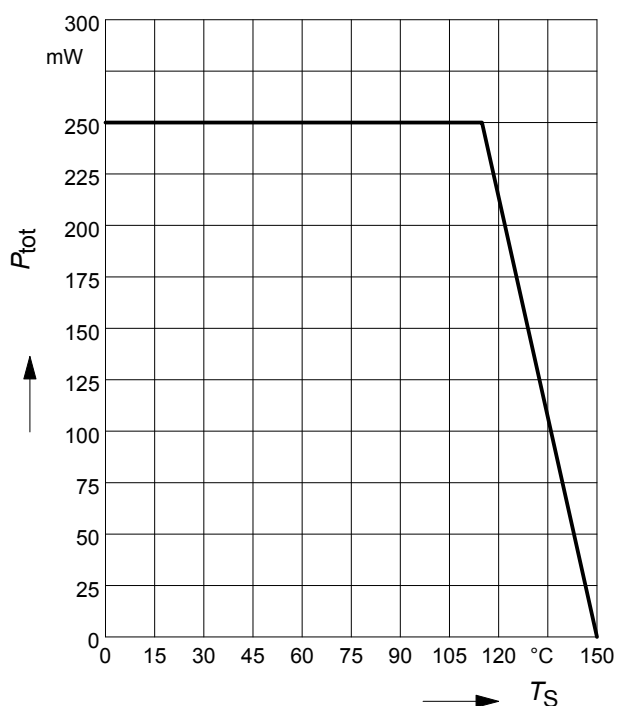




SMBT3904...MMBT3904

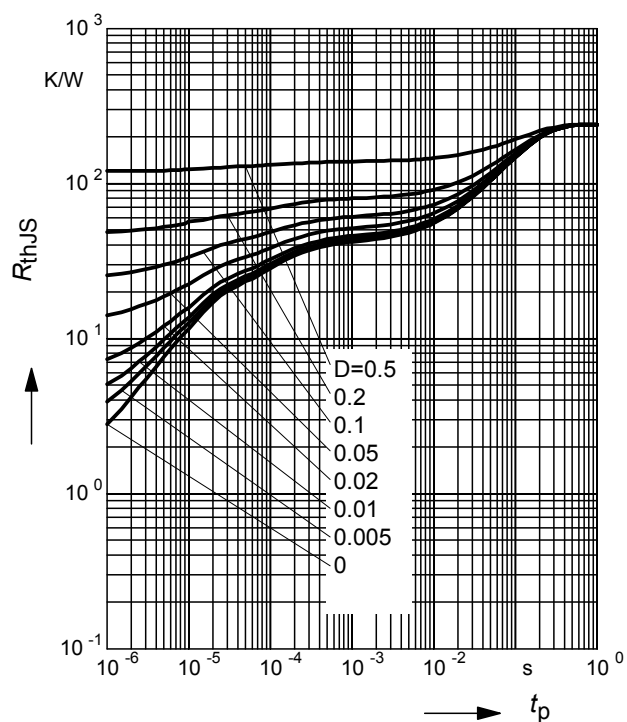
Total power dissipation $P_{\text{tot}} = f(T_S)$

SMBT3904S



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

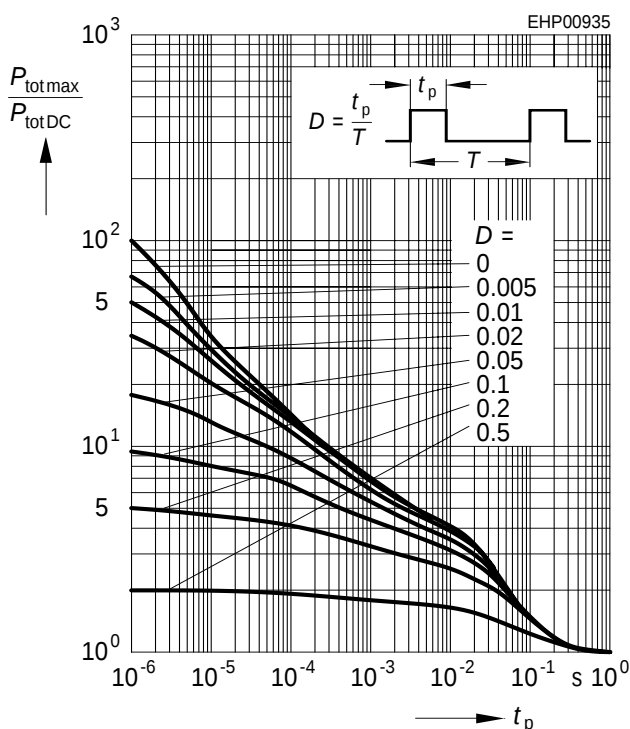
SMBT3904/ MMBT3904



Permissible Pulse Load

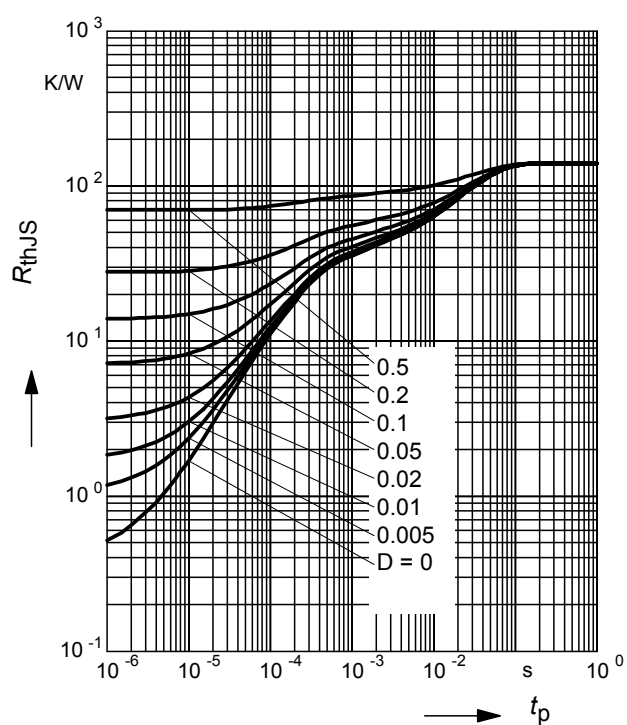
$P_{\text{totmax}}/P_{\text{totDC}} = f(t_p)$

SMBT3904/MMBT3904



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

SMBT3904S



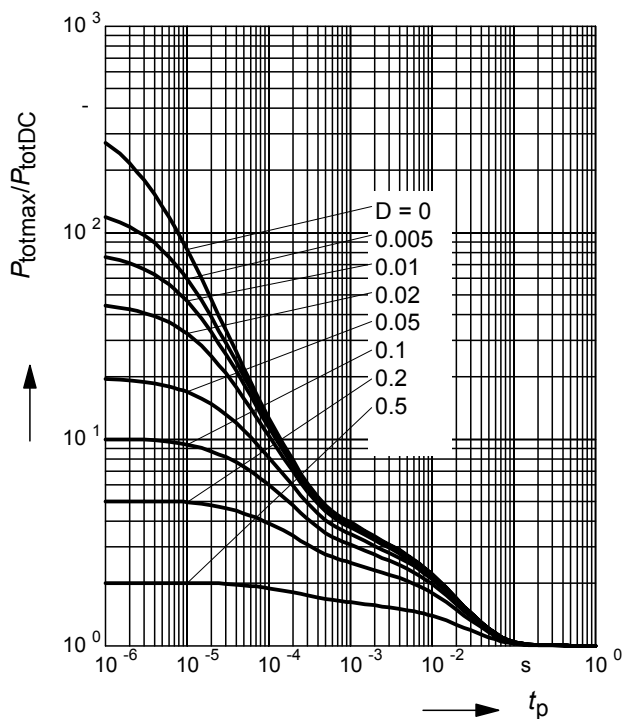


SMBT3904...MMBT3904

Permissible Pulse Load

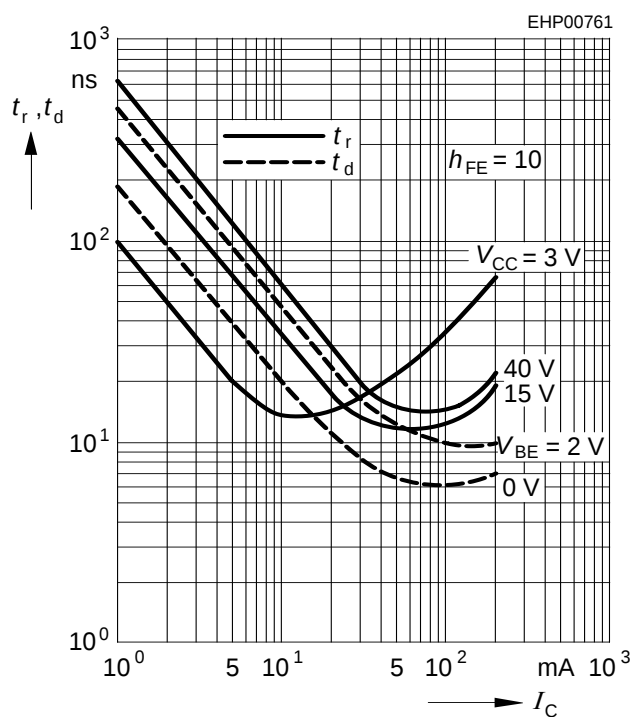
$$P_{\text{totmax}}/P_{\text{totDC}} = f(t_p)$$

SMBT3904S



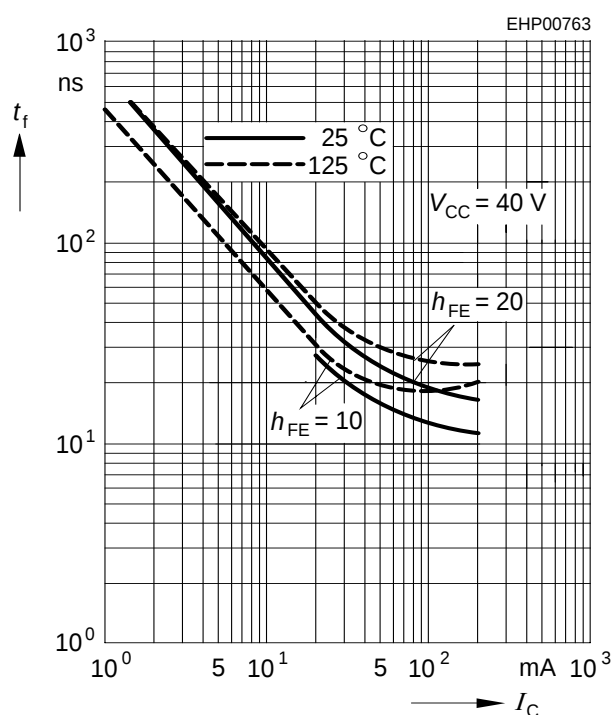
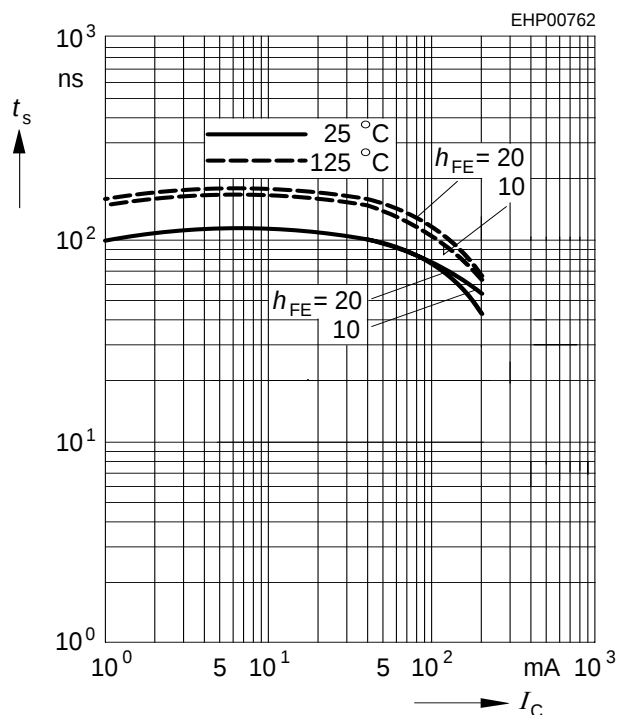
$$\text{Delay time } t_d = f(I_C)$$

$$\text{Rise time } t_r = f(I_C)$$



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

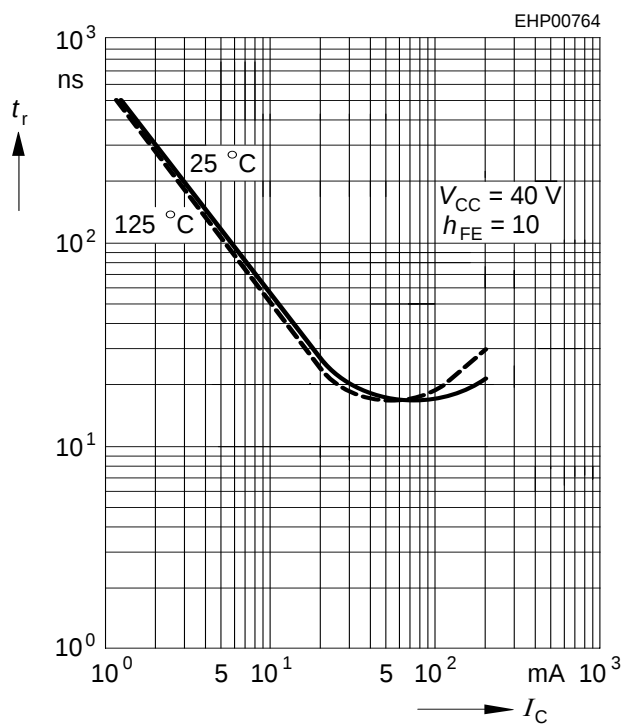
$$\text{Fall time } t_f = f(I_C)$$





SMBT3904...MMBT3904

Rise time $t_r = f(I_C)$

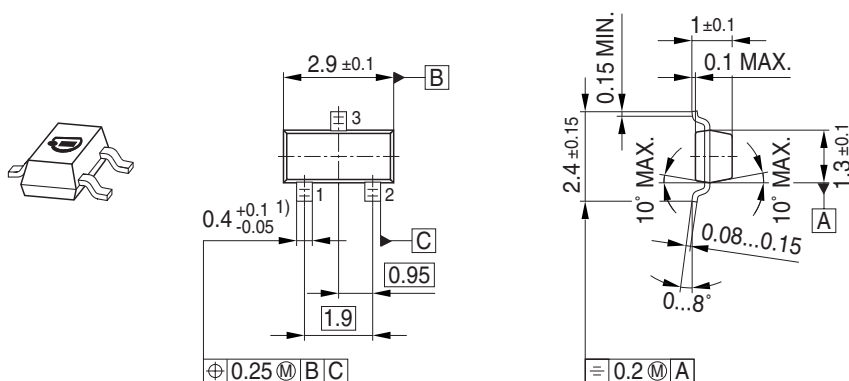




Package SOT23

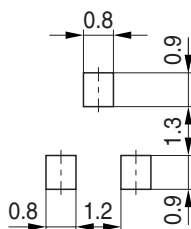
SMBT3904...MMBT3904

Package Outline

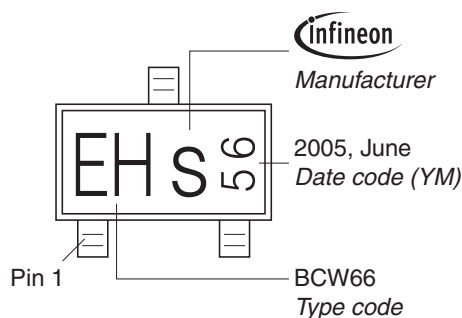


1) Lead width can be 0.6 max. in dambar area

Foot Print

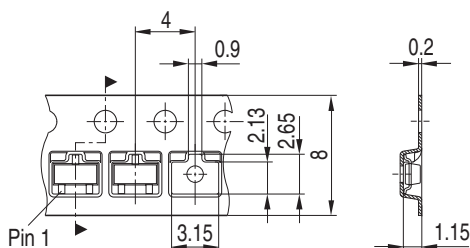


Marking Layout (Example)



Standard Packing

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

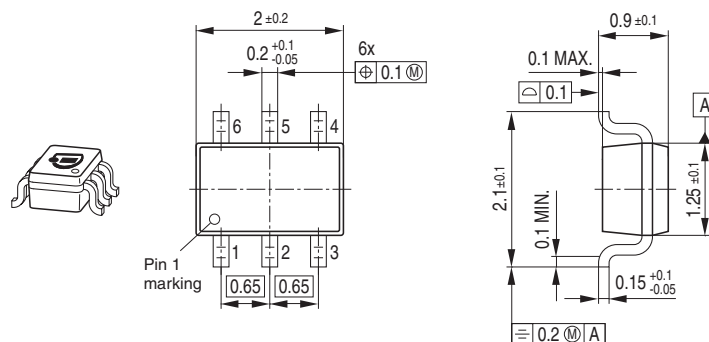




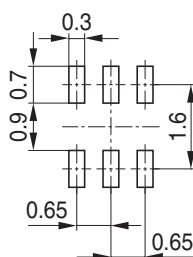
Package SOT363

SMBT3904...MMBT3904

Package Outline

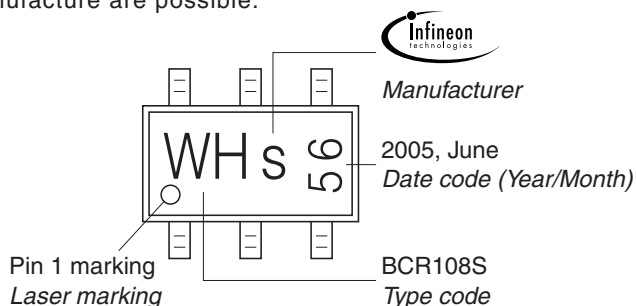


Foot Print



Marking Layout (Example)

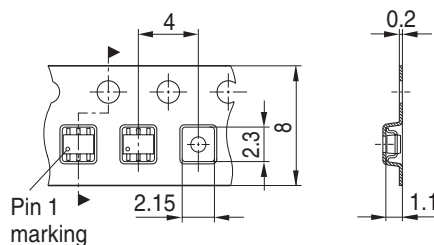
Small variations in positioning of
Date code, Type code and Manufacture are possible.



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.





SMBT3904...MMBT3904

Edition 2009-11-16

Published by
Infineon Technologies AG
81726 Munich, Germany

© 2009 Infineon Technologies AG
All Rights Reserved.

Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

Information

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office ([<www.infineon.com>](http://www.infineon.com)).

Warnings

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

Infineon Technologies components may be used in life-support devices or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.