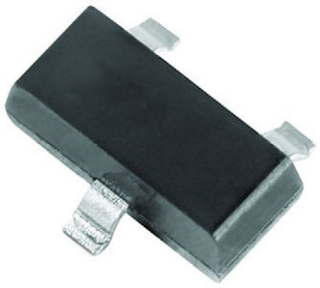
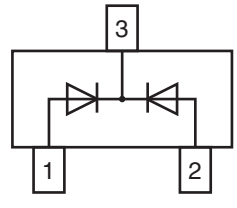
Small Signal Switching Diode, Dual





18108

FEATURES

- Silicon epitaxial planar diode
- Fast switching dual diode with common cathode
- AEC-Q101 qualified available
- Base P/N-E3 - RoHS-compliant, commercial grade
- Base P/N-HE3 - RoHS-compliant, AEC-Q101 qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

DESIGN SUPPORT TOOLS click logo to get started

3D Models Available

MECHANICAL DATA

Case: SOT-23

Weight: approx. 8.8 mg

Packaging codes / options:

18/10K per 13" reel (8 mm tape), 10K/box

08/3K per 7" reel (8 mm tape), 15K/box

PARTS TABLE

PART	ORDERING CODE	CIRCUIT CONFIGURATION	TYPE MARKING	REMARKS
BAV70	BAV70-E3-08 or BAV70-E3-18	Common cathode	JJ	Tape and reel
	BAV70-HE3-08 or BAV70-HE3-18			

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Peak reverse voltage		V_{RRM}	70	V
Reverse voltage		V_R	70	V
Forward current (continuous)		I_F	250	mA
Non repetitive peak forward current	t_p = 1 µs	I_{FSM}	2	A
	t_p = 1 ms	I_{FSM}	1	A
	t_p = 1 s	I_{FSM}	0.5	A
Power dissipation (1)		P_{tot}	350	mW

Note

(1) Device on fiberglass substrate

THERMAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
Thermal resistance junction to ambient air (1)		R_{thJA}	430	K/W
Junction temperature		T_j	150	°C
Storage temperature range		T_{stg}	-65 to +150	°C
Operating temperature range		T_{op}	-55 to +150	°C

Note

(1) Device on fiberglass substrate

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Forward voltage	I_F = 1 mA	V_F			0.715	V
	I_F = 10 mA	V_F			0.855	V
	I_F = 50 mA	V_F			1	V
	I_F = 150 mA	V_F			1.25	V
Reverse current	V_R = 70 V	I_R			2500	nA
	V_R = 70 V, T_j = 150 °C	I_R			50	µA
	V_R = 25 V, T_j = 150 °C	I_R			30	µA
Diode capacitance	V_R = 0 V, f = 1 MHz	C_D			1.5	pF
Reverse recovery time	I_F = 10 mA to i_R = 1 mA, V_R = 6 V, R_L = 100 Ω	t_{rr}			6	ns

TYPICAL CHARACTERISICS (T_{amb} = 25 °C, unless otherwise specified)

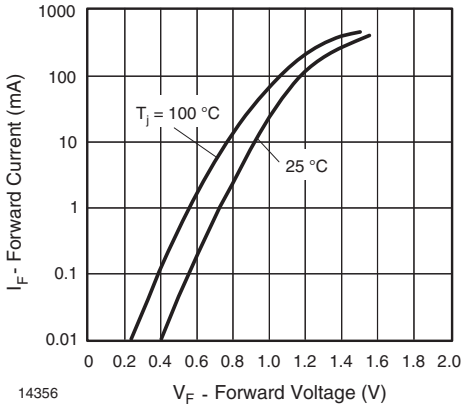


Fig. 1 - Forward Current vs. Forward Voltage

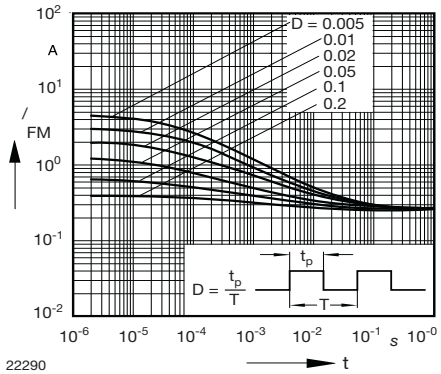
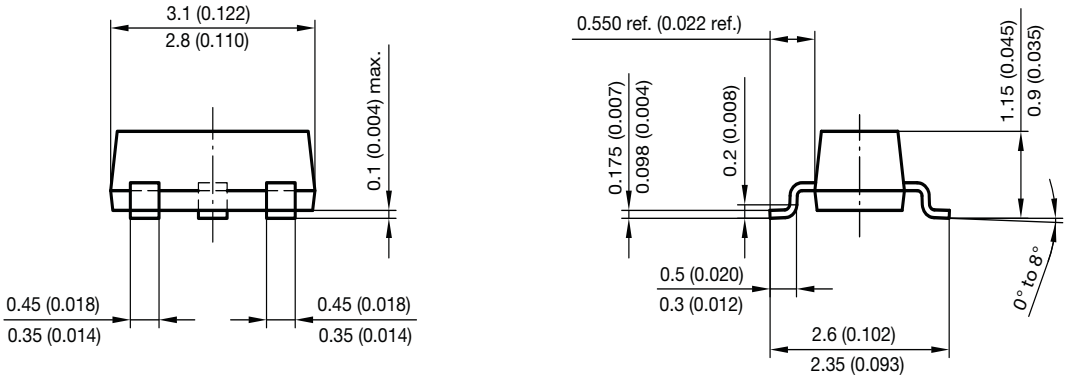
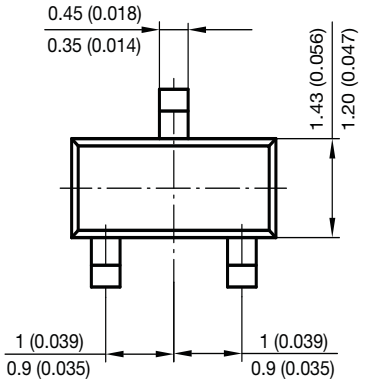


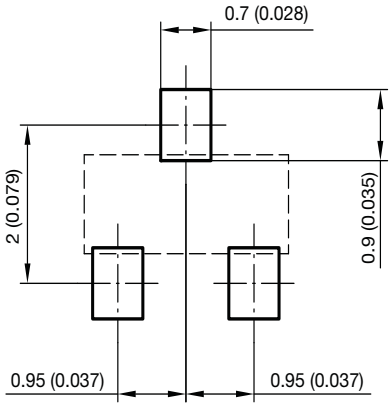
Fig. 2 - Peak forward current/$_{FM}$ = f (t_p)

PACKAGE DIMENSIONS in millimeters (inches): **SOT-23**





Foot print recommendation:



Document no.: 6.541-5014.01-4
Rev. 8 - Date: 23.Sept.2009
17418

BAV70 series

High-speed switching diodes

Rev. 8 — 18 March 2015 Product data sheet

1. Product profile

1.1 General description

High-speed switching diodes, encapsulated in small Surface-Mounted Device (SMD) plastic packages.

Table 1. Product overview

Type number	Package			Package configuration	Configuration
	Nexperia	JEITA	JEDEC		
BAV70	SOT23	-	TO-236AB	small	dual common cathode
BAV70M	SOT883	SC-101	-	leadless ultra small	dual common cathode
BAV70S	SOT363	SC-88	-	very small	quadruple common cathode/common cathode
BAV70T	SOT416	SC-75	-	ultra small	dual common cathode
BAV70W	SOT323	SC-70	-	very small	dual common cathode

1.2 Features and benefits

- High switching speed: $t_{rr} \leq 4$ ns
- Low leakage current
- Small SMD plastic packages
- Low capacitance: $C_d \leq 1.5$ pF
- Reverse voltage: $V_R \leq 100$ V
- AEC-Q101 qualified

1.3 Applications

- High-speed switching
- General-purpose switching

1.4 Quick reference data

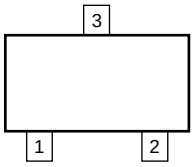
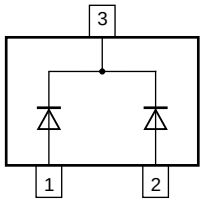
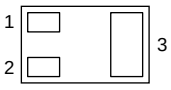
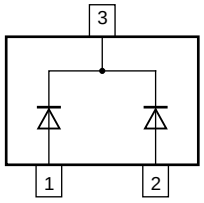
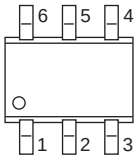
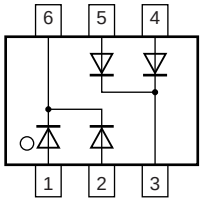
Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
I_R	reverse current	V_R = 80 V	-	-	0.5	µA
V_R	reverse voltage		-	-	100	V
t_{rr}	reverse recovery time	[1]	-	-	4	ns

[1] When switched from I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at I_R = 1 mA.

2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Symbol
BAV70; BAV70T; BAV70W			
1	anode (diode 1)	 006aaa144	 006aab034
2	anode (diode 2)		
3	common cathode		
BAV70M			
1	anode (diode 1)	 Transparent top view	 006aab034
2	anode (diode 2)		
3	common cathode		
BAV70S			
1	anode (diode 1)		 006aab104
2	anode (diode 2)		
3	common cathode (diode 3 and diode 4)		
4	anode (diode 3)		
5	anode (diode 4)		
6	common cathode (diode 1 and diode 2)		

3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
BAV70	-	plastic surface-mounted package; 3 leads	SOT23
BAV70M	SC-101	leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm	SOT883
BAV70S	SC-88	plastic surface-mounted package; 6 leads	SOT363
BAV70T	SC-75	plastic surface-mounted package; 3 leads	SOT416
BAV70W	SC-70	plastic surface-mounted package; 3 leads	SOT323

4. Marking

Table 5. Marking codes

Type number	Marking code[1]
BAV70	A4*
BAV70M	S4
BAV70S	A4*
BAV70T	A4
BAV70W	A4*

[1] * = -: made in Hong Kong
* = p: made in Hong Kong
* = t: made in Malaysia
* = W: made in China

5. Limiting values

Table 6. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
Per diode					
V_{RRM}	repetitive peak reverse voltage		-	100	V
V_R	reverse voltage		-	100	V
I_F	forward current				
	BAV70	$T_{amb} \leq 25$ °C	-	215	mA
	BAV70M	$T_s = 90$ °C	-	150	mA
	BAV70S	$T_s = 60$ °C	-	250	mA
	BAV70T	$T_s = 90$ °C	-	150	mA
	BAV70W	$T_{amb} \leq 25$ °C	-	175	mA
I_{FRM}	repetitive peak forward current				
	BAV70		-	450	mA
	BAV70M		-	500	mA
	BAV70S		-	450	mA
	BAV70T		-	500	mA
	BAV70W		-	500	mA
I_{FSM}	non-repetitive peak forward current	square wave [1]			
		$t_p = 1$ µs	-	4	A
		$t_p = 1$ ms	-	1	A
		$t_p = 1$ s	-	0.5	A

Table 6. Limiting values *...continued*

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
P_{tot}	total power dissipation	[2]			
	BAV70	$T_{amb} \leq 25$ °C	-	250	mW
	BAV70M	$T_{amb} \leq 25$ °C [3]	-	250	mW
	BAV70S	$T_s = 60$ °C	-	350	mW
	BAV70T	$T_s = 90$ °C	-	170	mW
	BAV70W	$T_{amb} \leq 25$ °C	-	200	mW
Per device					
I_F	forward current				
	BAV70	$T_{amb} \leq 25$ °C	-	125	mA
	BAV70M	$T_s = 90$ °C	-	75	mA
	BAV70S	$T_s = 60$ °C	-	100	mA
	BAV70T	$T_s = 90$ °C	-	75	mA
	BAV70W	$T_{amb} \leq 25$ °C	-	100	mA
T_j	junction temperature		-	150	°C
T_{amb}	ambient temperature		−65	+150	°C
T_{stg}	storage temperature		−65	+150	°C

[1] $T_j = 25$ °C prior to surge.

[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

[3] Reflow soldering is the only recommended soldering method.

6. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air [1]				
	BAV70		-	-	500	K/W
	BAV70M	[2]	-	-	500	K/W
	BAV70W		-	-	625	K/W
$R_{th(j-t)}$	thermal resistance from junction to tie-point					
	BAV70		-	-	360	K/W
	BAV70W		-	-	300	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point					
	BAV70S		-	-	255	K/W
	BAV70T		-	-	350	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Reflow soldering is the only recommended soldering method.

7. Characteristics

Table 8. Characteristics

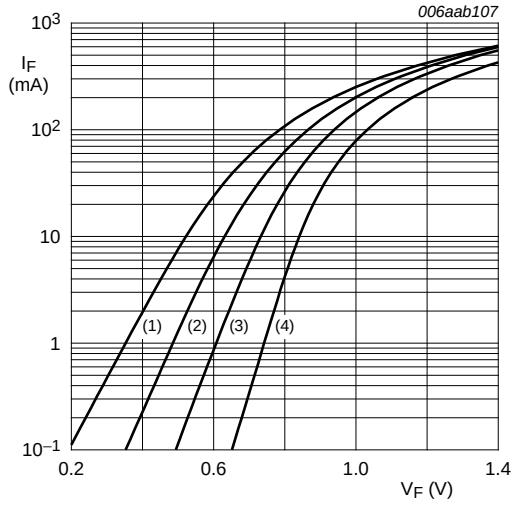
T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per diode						
V_F	forward voltage	[1]				
		I_F = 1 mA	-	-	715	mV
		I_F = 10 mA	-	-	855	mV
		I_F = 50 mA	-	-	1	V
		I_F = 150 mA	-	-	1.25	V
I_R	reverse current	V_R = 25 V	-	-	30	nA
		V_R = 80 V	-	-	0.5	µA
		V_R = 25 V; T_j = 150 °C	-	-	30	µA
		V_R = 80 V; T_j = 150 °C	-	-	100	µA
C_d	diode capacitance	V_R = 0 V; f = 1 MHz	-	-	1.5	pF
t_{rr}	reverse recovery time	[2]	-	-	4	ns
V_{FR}	forward recovery voltage	[3]	-	-	1.75	V

[1] Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$.

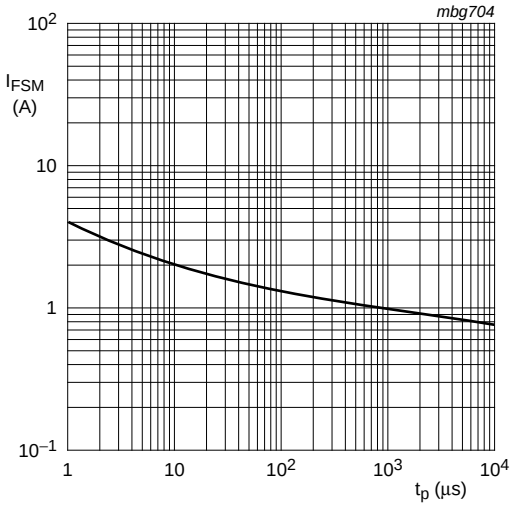
[2] When switched from I_F = 10 mA to I_R = 10 mA; R_L = 100 Ω; measured at I_R = 1 mA.

[3] When switched from I_F = 10 mA; t_r = 20 ns.



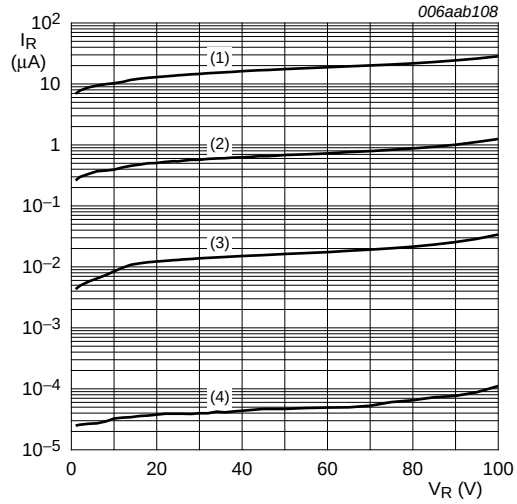
(1) T_{amb} = 150 °C
(2) T_{amb} = 85 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = −40 °C

Fig 1. Forward current as a function of forward voltage; typical values



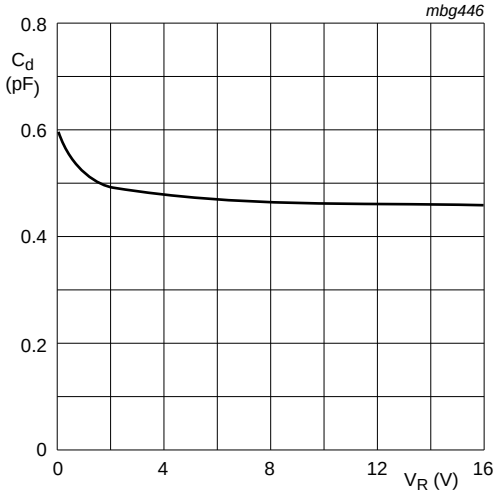
Based on square wave currents.
T_j = 25 °C; prior to surge

Fig 2. Non-repetitive peak forward current as a function of pulse duration; maximum values



(1) T_{amb} = 150 °C
(2) T_{amb} = 85 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = −40 °C

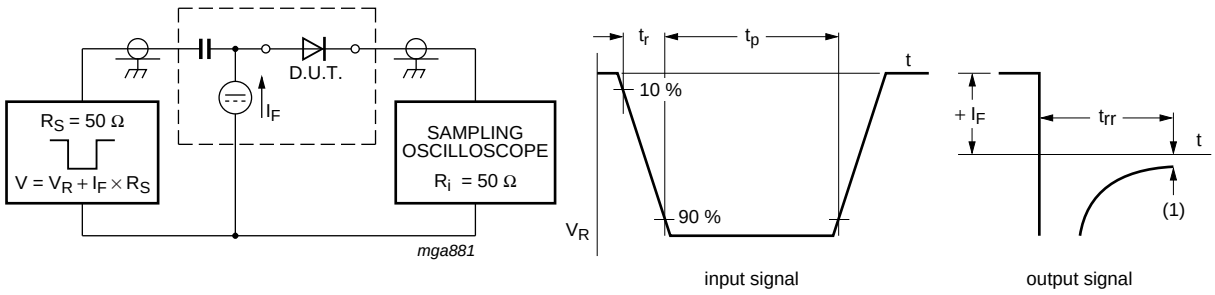
Fig 3. Reverse current as a function of reverse voltage; typical values



f = 1 MHz; T_{amb} = 25 °C

Fig 4. Diode capacitance as a function of reverse voltage; typical values

8. Test information

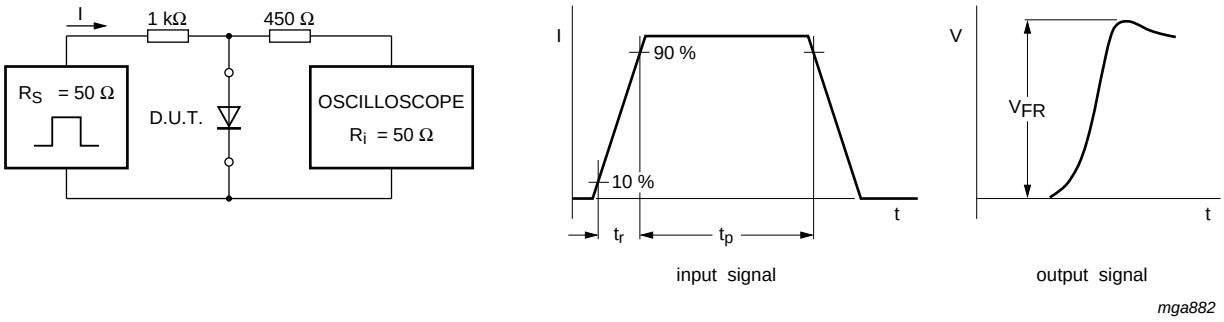


(1) I_R = 1 mA

Input signal: reverse pulse rise time t_r = 0.6 ns; reverse voltage pulse duration t_p = 100 ns; duty cycle δ = 0.05

Oscilloscope: rise time t_r = 0.35 ns

Fig 5. Reverse recovery time test circuit and waveforms



Input signal: forward pulse rise time t_r = 20 ns; forward current pulse duration $t_p \geq$ 100 ns; duty cycle $\delta \leq$ 0.005

Fig 6. Forward recovery voltage test circuit and waveforms

8.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard *Q101 - Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

9. Package outline

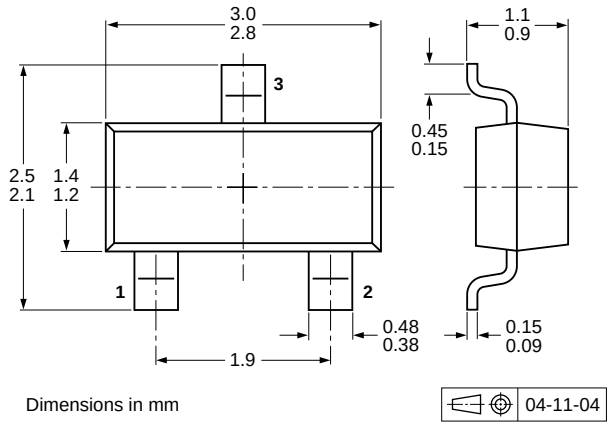


Fig 7. Package outline BAV70 (SOT23/TO-236AB)

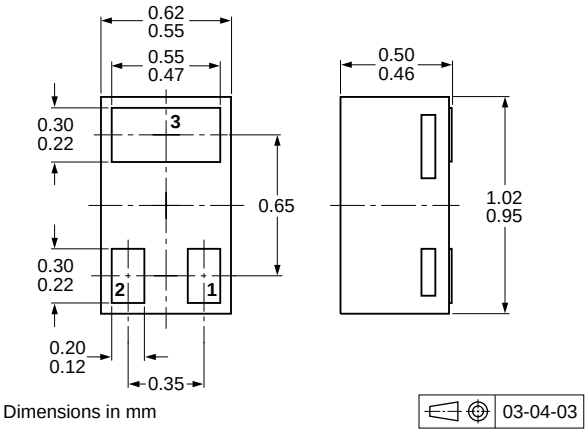


Fig 8. Package outline BAV70M (SOT883/SC-101)

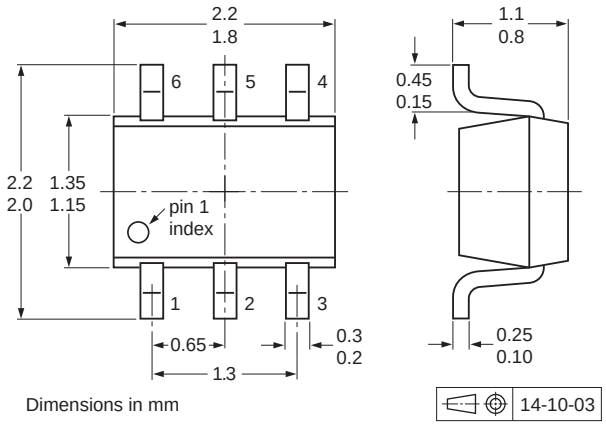


Fig 9. Package outline BAV70S (SOT363/SC-88)

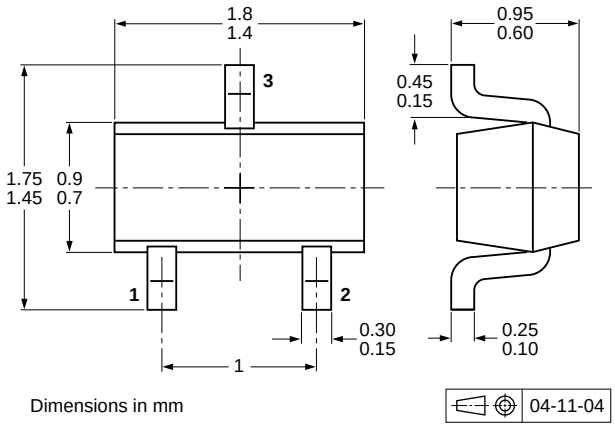


Fig 10. Package outline BAV70T (SOT416/SC-75)

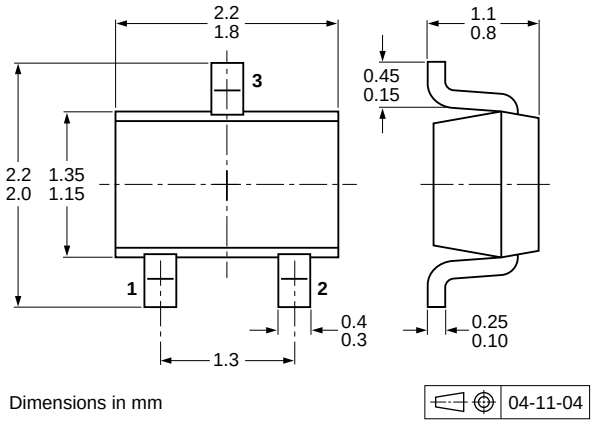


Fig 11. Package outline BAV70W (SOT323/SC-70)

10. Packing information

Table 9. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.[1]

Type number	Package	Description	Packing quantity	
			3000	10000
BAV70	SOT23	4 mm pitch, 8 mm tape and reel	-215	-235
BAV70M	SOT883	2 mm pitch, 8 mm tape and reel	-	-315
BAV70S	SOT363	4 mm pitch, 8 mm tape and reel; T1 [2]	-115	-135
		4 mm pitch, 8 mm tape and reel; T2 [3]	-125	-165
BAV70T	SOT416	4 mm pitch, 8 mm tape and reel	-115	-135
BAV70W	SOT323	4 mm pitch, 8 mm tape and reel	-115	-135

[1] For further information and the availability of packing methods, see Section 14.

[2] T1: normal taping

[3] T2: reverse taping

11. Soldering

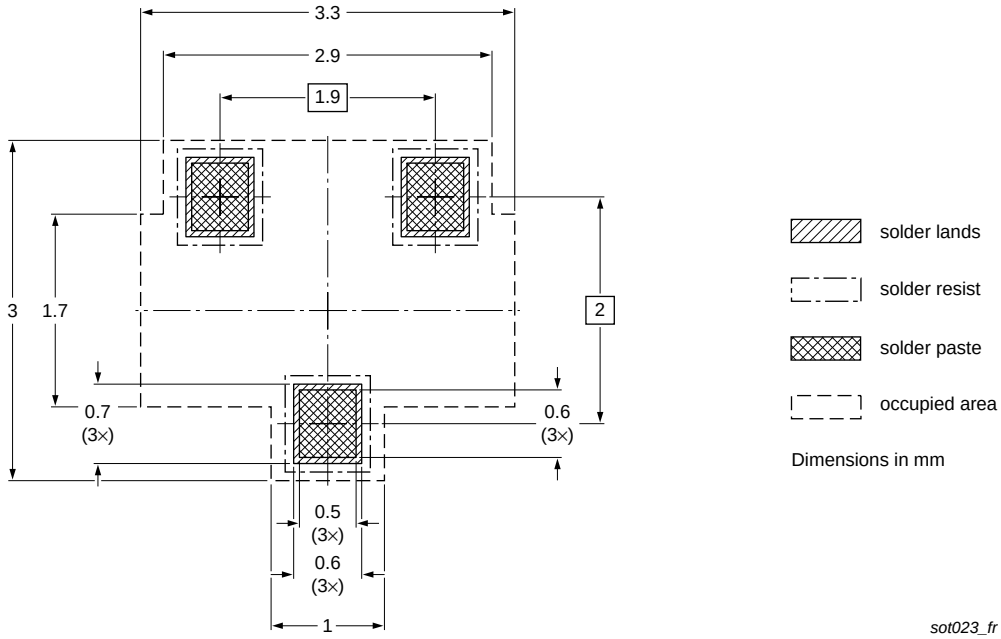


Fig 12. Reflow soldering footprint BAV70 (SOT23/TO-236AB)

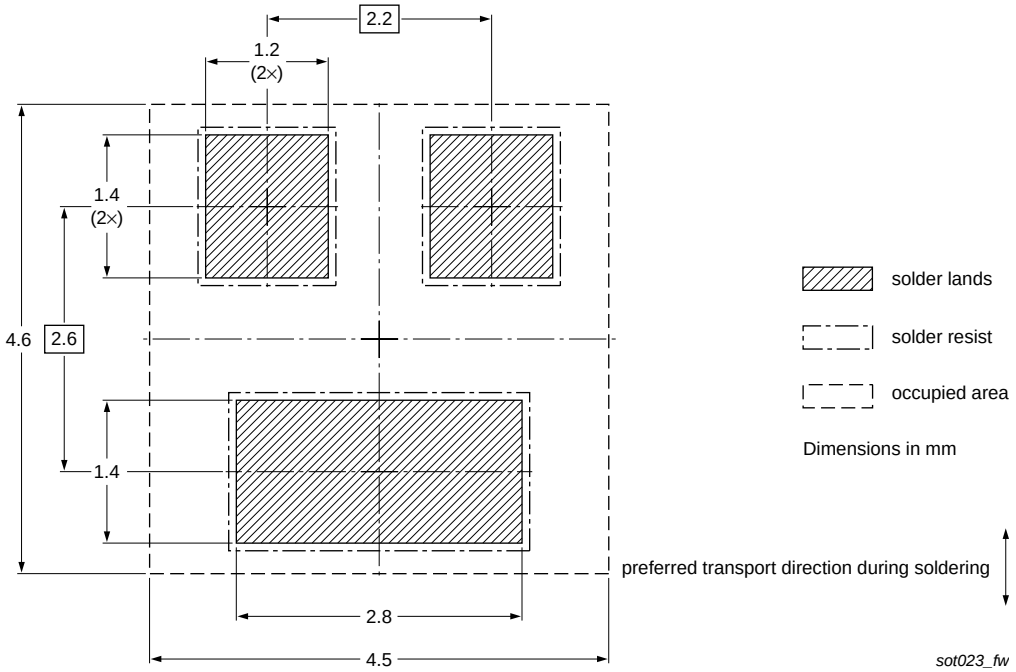
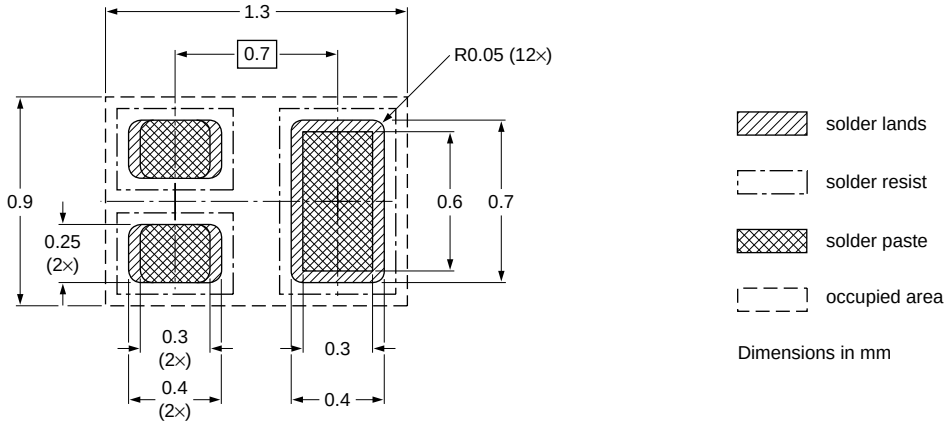


Fig 13. Wave soldering footprint BAV70 (SOT23/TO-236AB)



Reflow soldering is the only recommended soldering method.

Fig 14. Reflow soldering footprint BAV70M (SOT883/SC-101)

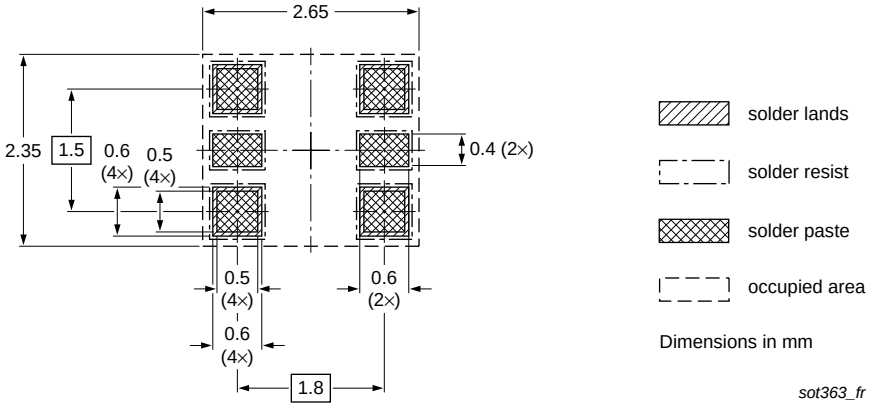


Fig 15. Reflow soldering footprint BAV70S (SOT363/SC-88)

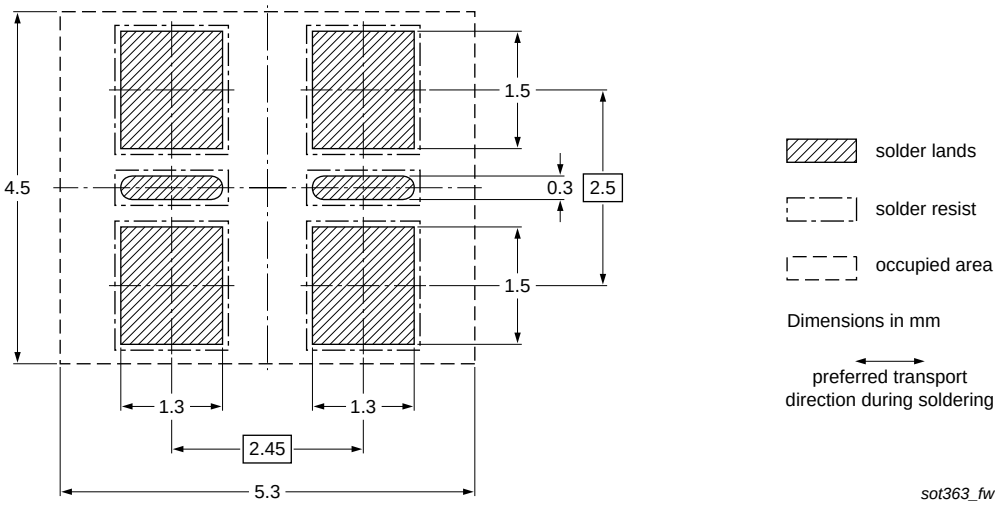


Fig 16. Wave soldering footprint BAV70S (SOT363/SC-88)

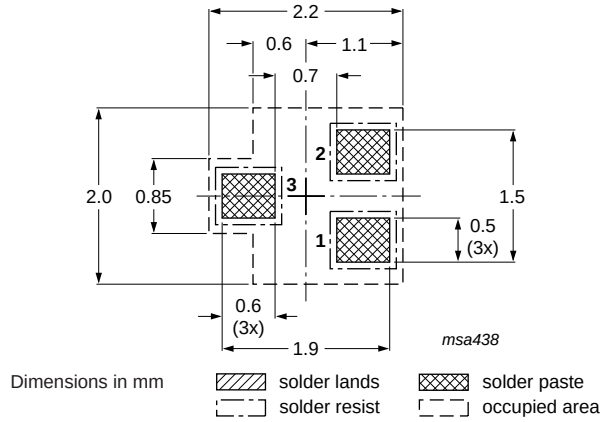


Fig 17. Reflow soldering footprint BAV70T (SOT416/SC-75)

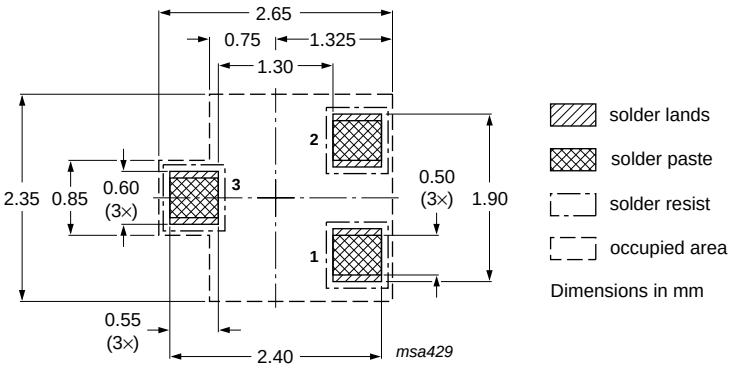


Fig 18. Reflow soldering footprint BAV70W (SOT323/SC-70)

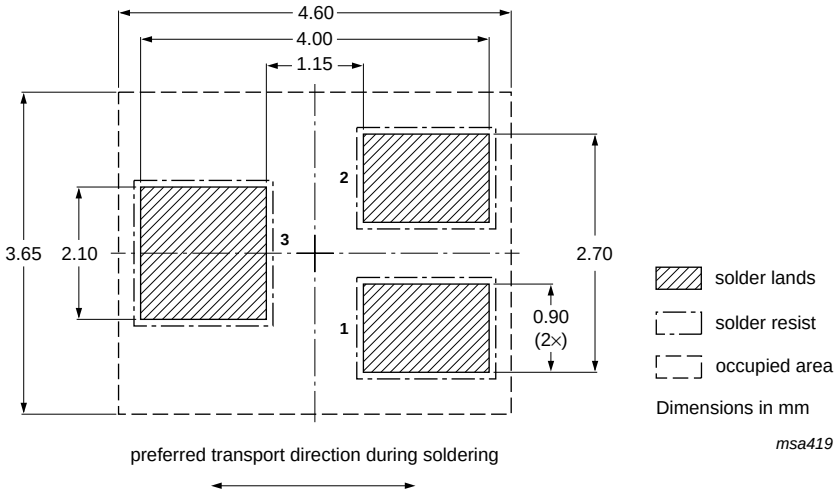
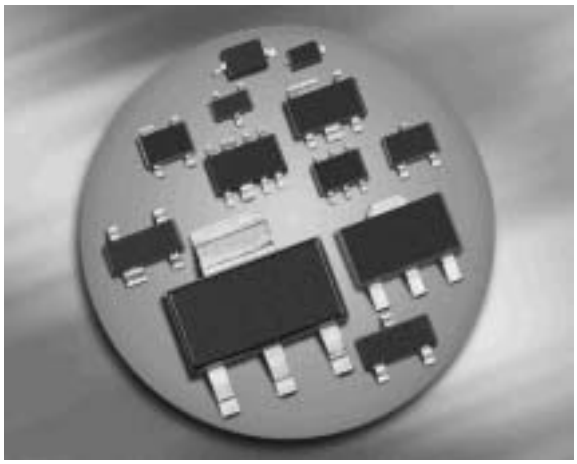


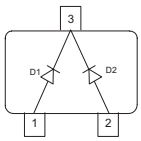
Fig 19. Wave soldering footprint BAV70W (SOT323/SC-70)

Silicon Switching Diode

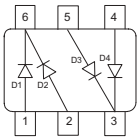
- For high-speed switching applications
- Common cathode configuration
- BAV70S / U: For orientation in reel see package information below
- Pb-free (RoHS compliant) package[1)]
- Qualified according AEC Q101



BAV70
BAV70W



BAV70S
BAV70U



Type	Package	Configuration	Marking
BAV70	SOT23	common cathode	A4s
BAV70S	SOT363	double common cathode	A4s
BAV70U	SC74	double common cathode	A4s
BAV70W	SOT323	common cathode	A4s

[1]Pb-containing package may be available upon special request

Maximum Ratings at T_A = 25°C, unless otherwise specified

Parameter	Symbol	Value	Unit
Diode reverse voltage	V_R	80	V
Peak reverse voltage	V_{RM}	85	
Forward current	I_F	200	mA
Non-repetitive peak surge forward current	I_{FSM}		A
t = 1 µs		4.5	
t = 1 ms		1	
t = 1 s single		0.5	
t = 1 s double		0.75	
Total power dissipation	P_{tot}		mW
BAV70, $T_S \leq$ 33°C		250	
BAV70S, $T_S \leq$ 85°C		250	
BAV70U, $T_S \leq$ 90°C		250	
BAV70W, $T_S \leq$ 103°C		250	
Junction temperature	T_j	150	°C
Storage temperature	T_{stg}	-65 ... 150	

Thermal Resistance

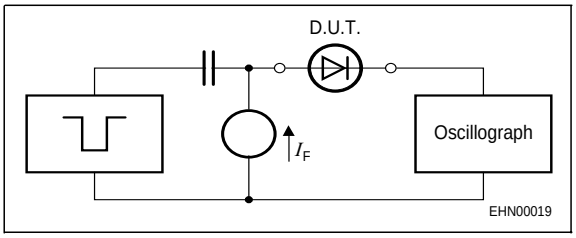
Parameter	Symbol	Value	Unit
Junction - soldering point[1)]	R_{thJS}		K/W
BAV70		≤ 460	
BAV70S		≤ 260	
BAV70U		≤ 240	
BAV70W		≤ 190	

[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					
Breakdown voltage $I_{(BR)}$ = 100 µA	$V_{(BR)}$	85	-	-	V
Reverse current	I_R				µA
V_R = 70 V		-	-	0.15	
V_R = 25 V, T_A = 150 °C		-	-	30	
V_R = 70 V, T_A = 150 °C		-	-	50	
Forward voltage	V_F				mV
I_F = 1 mA		-	-	715	
I_F = 10 mA		-	-	855	
I_F = 50 mA		-	-	1000	
I_F = 100 mA		-	-	1200	
I_F = 150 mA		-	-	1250	
AC Characteristics					
Diode capacitance V_R = 0 V, f = 1 MHz	C_T	-	-	1.5	pF
Reverse recovery time I_F = 10 mA, I_R = 10 mA, measured at I_R = 1mA , R_L = 100 Ω	t_{rr}	-	-	4	ns

Test circuit for reverse recovery time

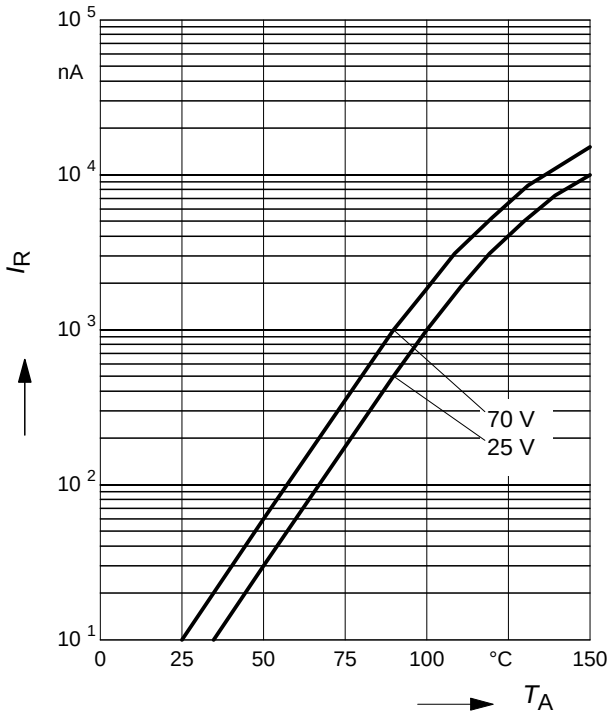


Pulse generator: t_p = 100ns, D = 0.05, t_r = 0.6ns, R_i = 50Ω

Oscillograph: R = 50Ω, t_r = 0.35ns, C = 0.05pF

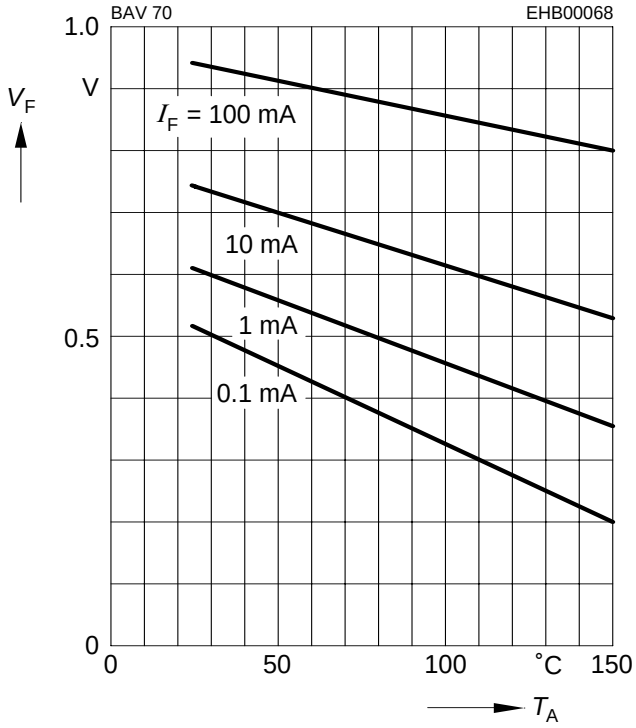
Reverse current $I_R = f(T_A)$

V_R = Parameter



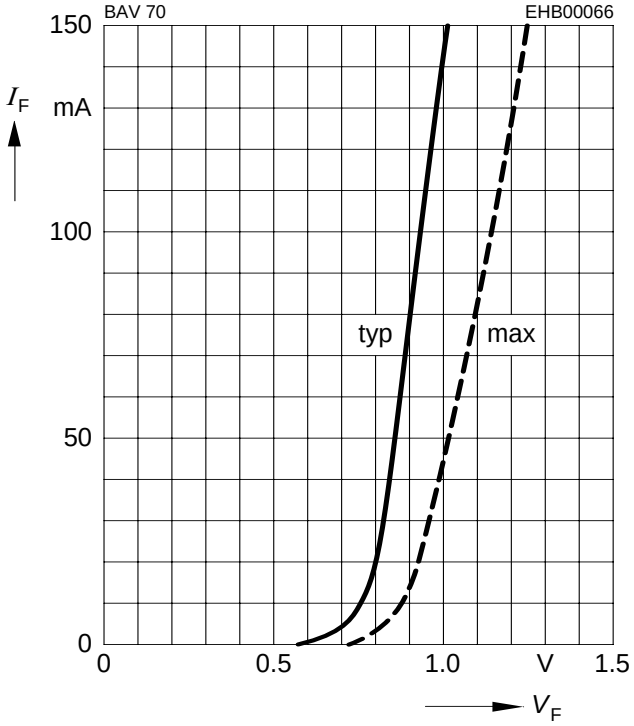
Forward Voltage $V_F = f(T_A)$

I_F = Parameter



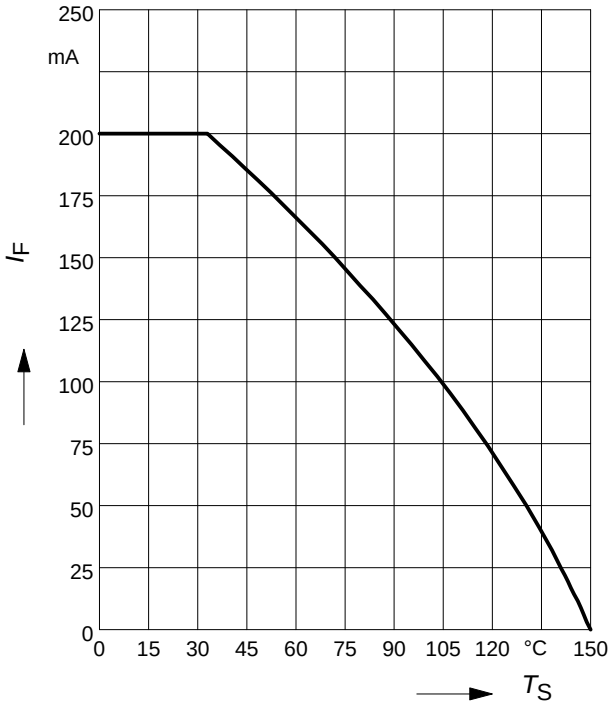
Forward current $I_F = f(V_F)$

T_A = 25°C



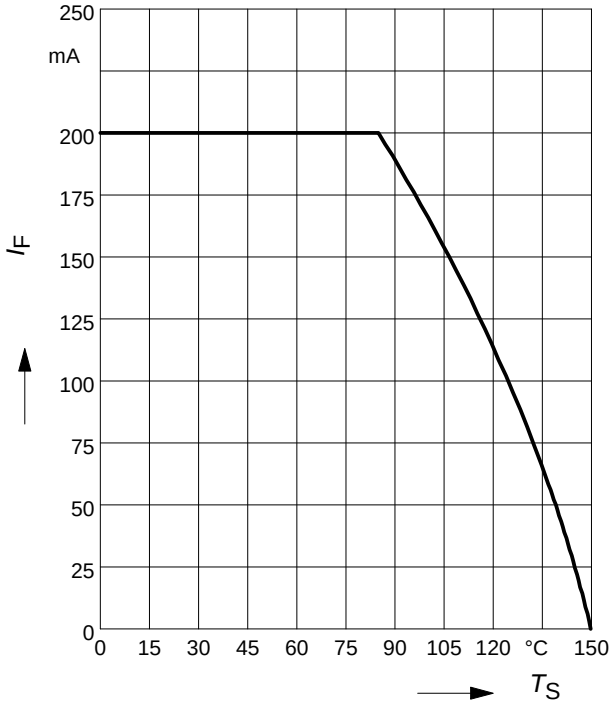
Forward current $I_F = f(T_S)$

BAV70



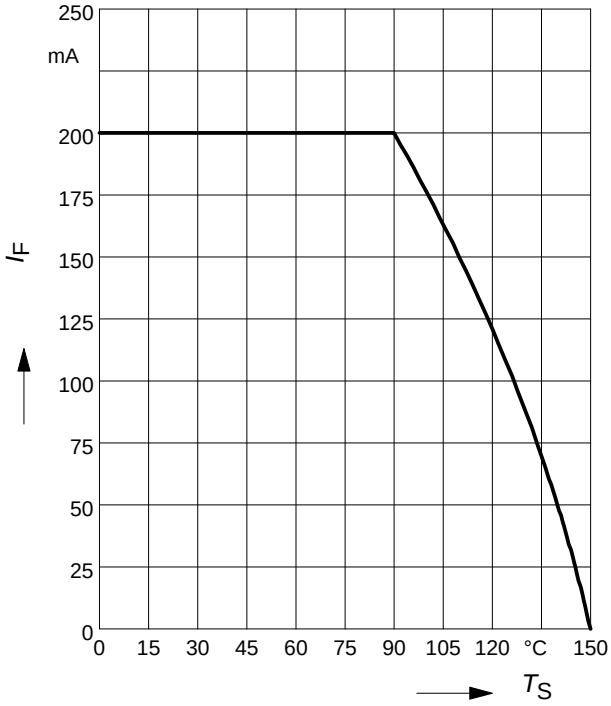
Forward current $I_F = f(T_S)$

BAV70S



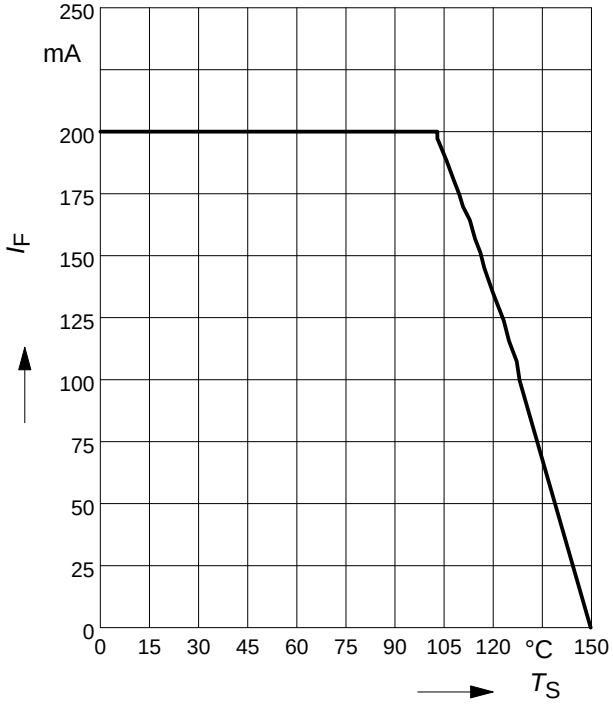
Forward current $I_F = f(T_S)$

BAV70U



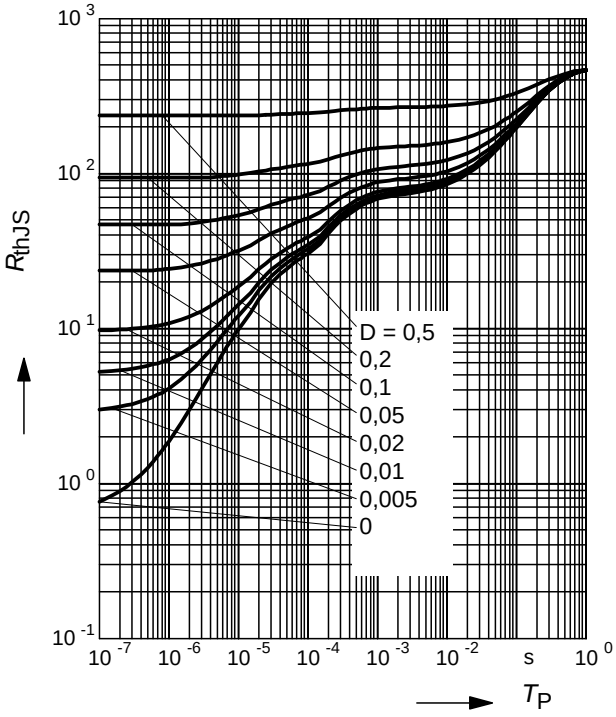
Forward current $I_F = f(T_S)$

BAV70W



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

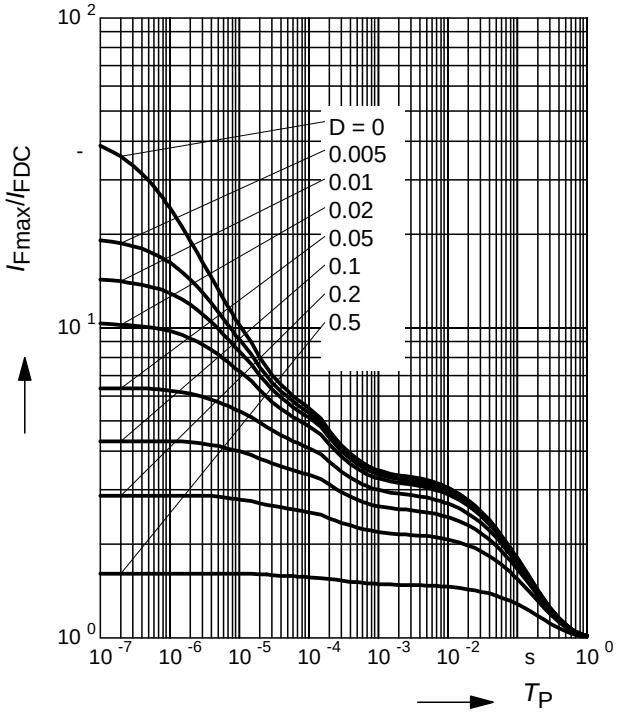
BAV70



Permissible Pulse Load

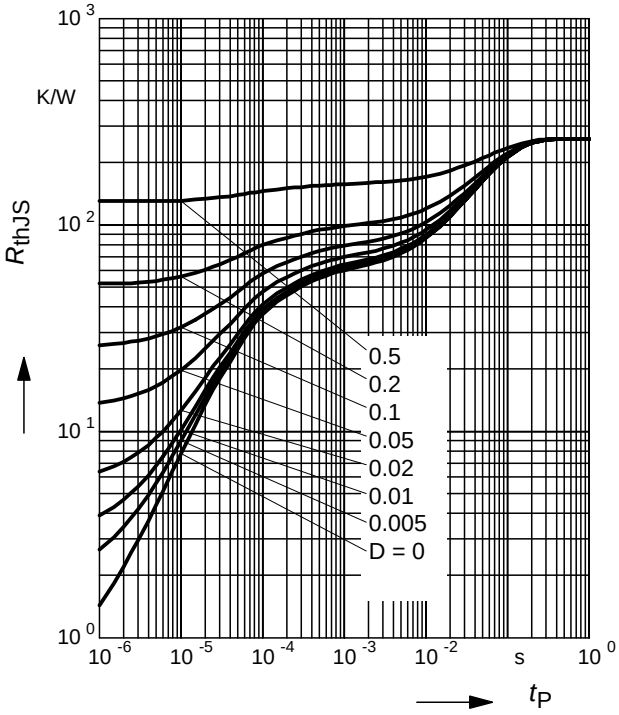
$I_{Fmax}/ I_{FDC} = f(t_p)$

BAV70



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

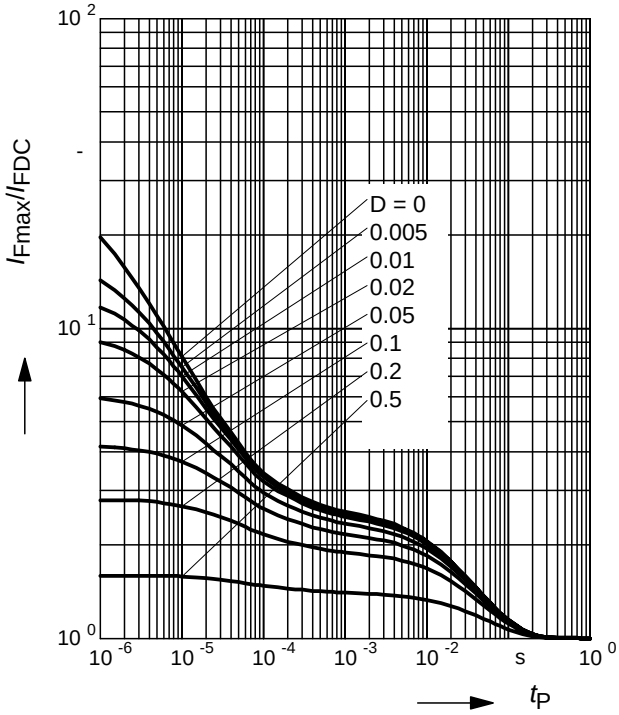
BAV70S



Permissible Pulse Load

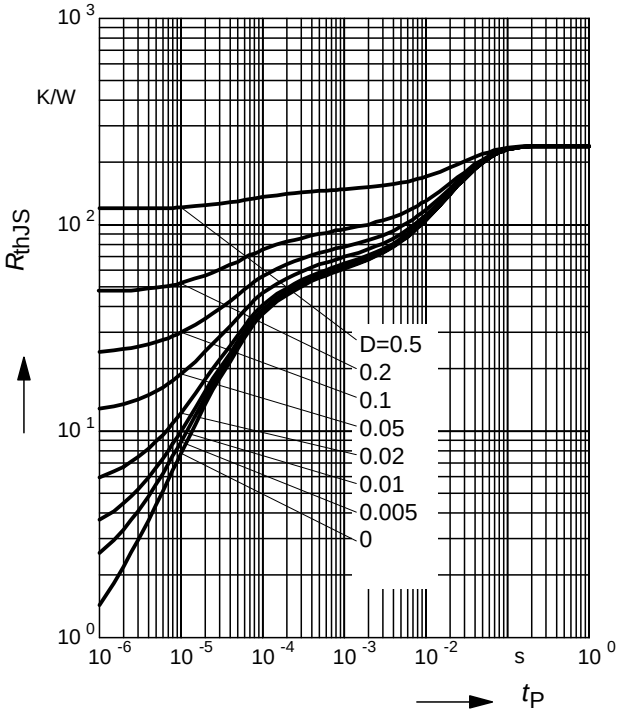
$I_{Fmax}/ I_{FDC} = f(t_p)$

BAV70S



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

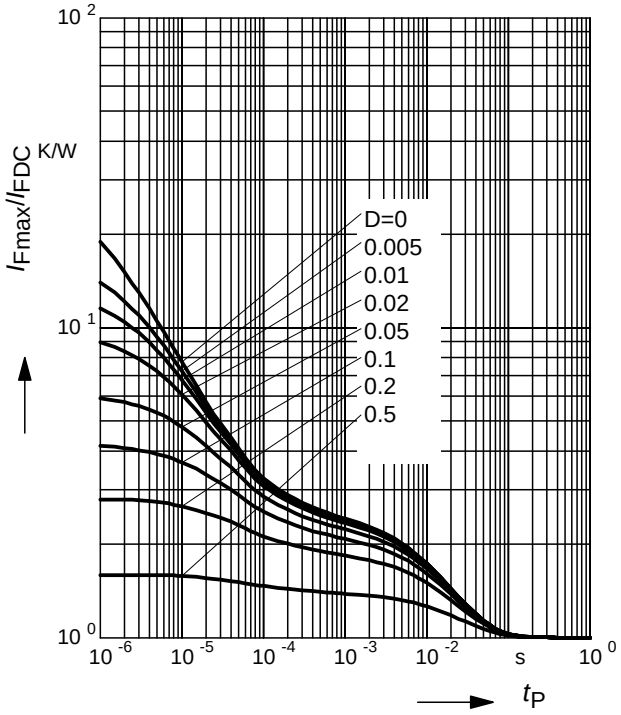
BAV70U



Permissible Pulse Load

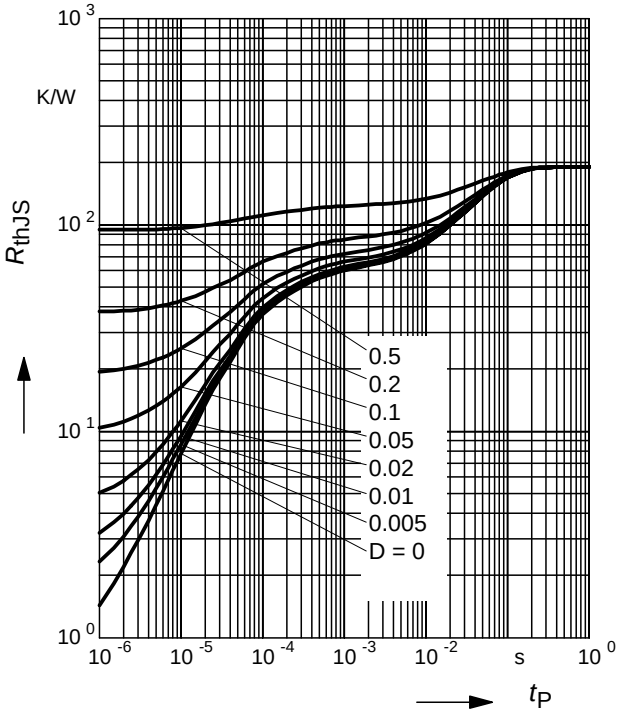
$I_{Fmax}/ I_{FDC} = f(t_p)$

BAV70U



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

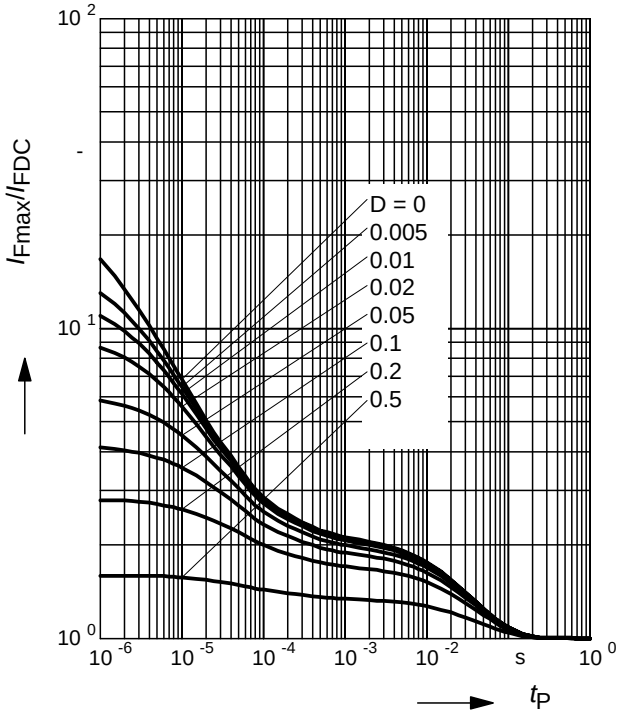
BAV70W



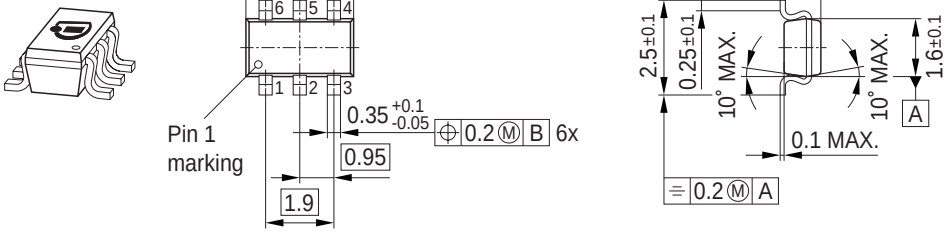
Permissible Pulse Load

$I_{Fmax}/ I_{FDC} = f(t_p)$

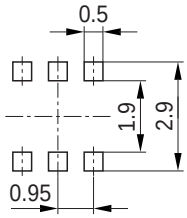
BAV70W



Package Outline

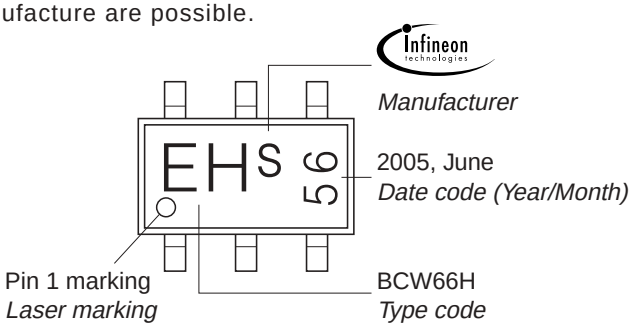


Foot Print



Marking Layout (Example)

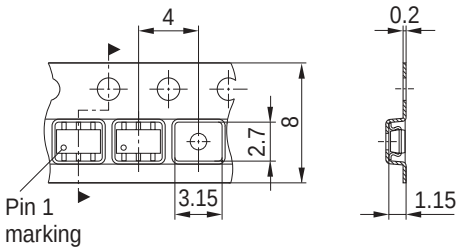
Small variations in positioning of
Date code, Type code and Manufacture are possible.



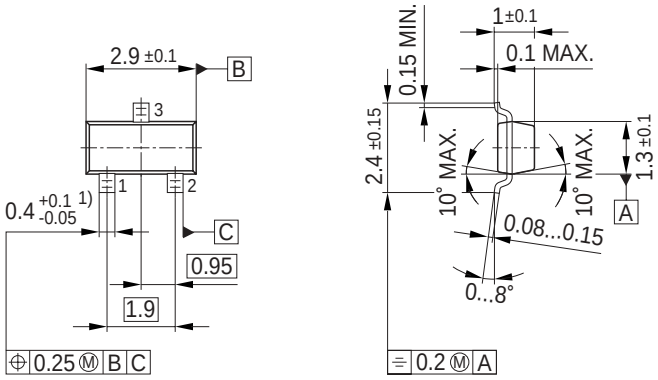
Standard Packing

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

For symmetric types no defined Pin 1 orientation in reel.

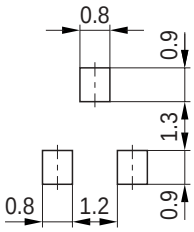


Package Outline

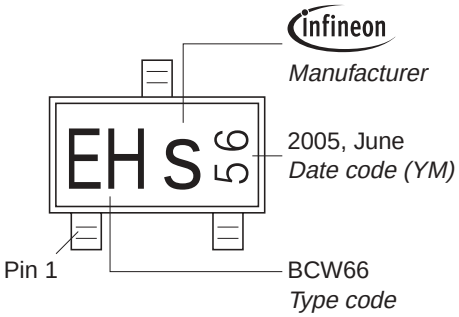


1) Lead width can be 0.6 max. in dambar area

Foot Print

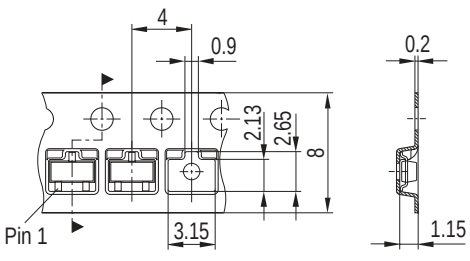


Marking Layout (Example)

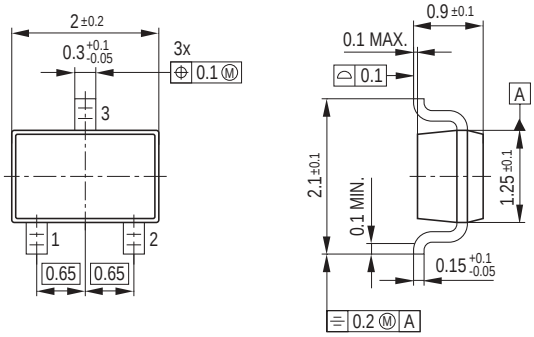


Standard Packing

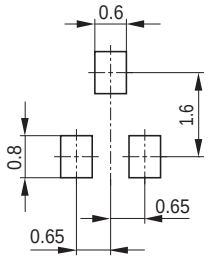
Reel ø180 mm = 3.000 Pieces/Reel
Reel ø330 mm = 10.000 Pieces/Reel



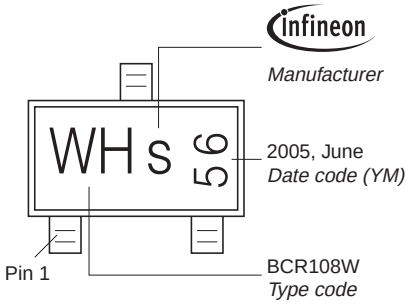
Package Outline



Foot Print

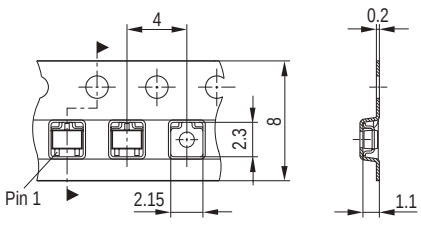


Marking Layout (Example)

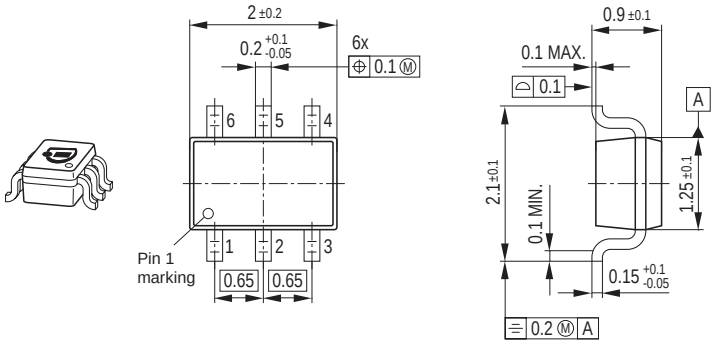


Standard Packing

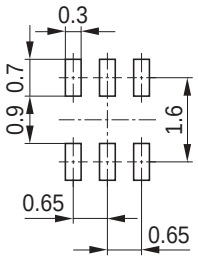
Reel ø180 mm = 3.000 Pieces/Reel
Reel ø330 mm = 10.000 Pieces/Reel



Package Outline

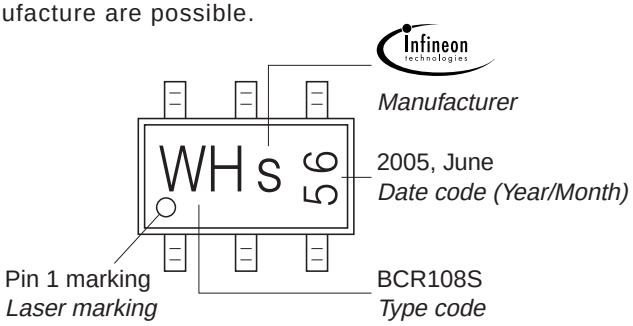


Foot Print



Marking Layout (Example)

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



Standard Packing

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

For symmetric types no defined Pin 1 orientation in reel.