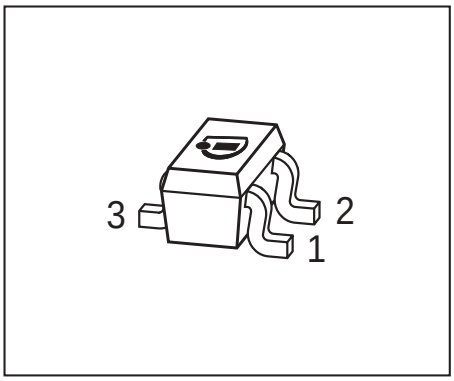
NPN Silicon RF Transistor



- For low noise, high-gain broadband amplifiers at collector currents from 1 mA to 20 mA
- f_T = 9 GHz, F = 1 dB at 1 GHz
- Pb-free (RoHS compliant) package[1)]
- Qualified according AEC Q101

AEC Qualified RoHS

ESD (**E**lectro**s**tatic **d**ischarge) sensitive device, observe handling precaution!

Type	Marking	Pin Configuration			Package
BFR949T	RK	1 = B	2 = E	3 = C	SC75

Maximum Ratings

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	10	V
Collector-emitter voltage	V_{CES}	20	
Collector-base voltage	V_{CBO}	20	
Emitter-base voltage	V_{EBO}	1.5	
Collector current	I_C	50	mA
Base current	I_B	5	
Total power dissipation[2)] $T_S \leq 75$ °C	P_{tot}	250	mW
Junction temperature	T_j	150	°C
Ambient temperature	T_A	-65 ... 150	
Storage temperature	T_{stg}	-65 ... 150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point[3)]	R_{thJS}	≤ 300	K/W

[1]Pb-containing package may be available upon special request
[2]T_S is measured on the collector lead at the soldering point to the pcb
[3]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 = 1 mA, I_B = 0	$V_{(BR)CEO}$	10	-	-	V
Collector-emitter cutoff current V_{CE} = 20 V, V_{BE} = 0	I_{CES}	-	-	100	µA
Collector-base cutoff current V_{CB} = 10 V, I_E = 0	I_{CBO}	-	-	100	nA
Emitter-base cutoff current V_{EB} = 1 V, I_C = 0	I_{EBO}	-	-	0.1	µA
DC current gain- I_C = 5 mA, V_{CE} = 6 V, pulse measured	h_{FE}	100	140	180	-

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

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency I_C = 15 mA, V_{CE} = 6 V, f = 1 GHz	f_T	7	9	-	GHz
Collector-base capacitance V_{CB} = 10 V, f = 1 MHz, V_{BE} = 0 , emitter grounded	C_{cb}	-	0.31	0.4	pF
Collector emitter capacitance V_{CE} = 10 V, f = 1 MHz, V_{BE} = 0 , base grounded	C_{ce}	-	0.2	-	
Emitter-base capacitance V_{EB} = 0.5 V, f = 1 MHz, V_{CB} = 0 , collector grounded	C_{eb}	-	0.7	-	
Noise figure I_C = 5 mA, V_{CE} = 6 V, Z_S = Z_{Sopt} , f = 1 GHz I_C = 3 mA, V_{CE} = 8 V, Z_S = Z_{Sopt} , f = 1.8 GHz	F	 - -	 1 1.3	 2.5 -	dB
Power gain[1)] I_C = 10 mA, V_{CE} = 8 V, Z_S = Z_{Sopt} , Z_L = Z_{Lopt}, f = 900 MHz	G_{ms}	-	20	-	-
Power gain, maximum available[1)] I_C = 10 mA, V_{CE} = 8 V, Z_S = Z_{Sopt} , Z_L = Z_{Lopt} , f = 1.8 GHz	G_{ma}	-	14	-	dB
Transducer gain I_C = 15 mA, V_{CE} = 6 V, Z_S = Z_L = 50Ω , f = 1 GHz I_C = 10 mA, V_{CE} = 8 V, Z_S = Z_L = 50Ω , f = 1.8 GHz	$\lvert S_{21e}\rvert^2$	 13 -	 16 11	 - -	dB

[1] $G_{ma} = |S_{21} / S_{12}| (k-(k^2-1)^{1/2})$, $G_{ms} = |S_{21} / S_{12}|$

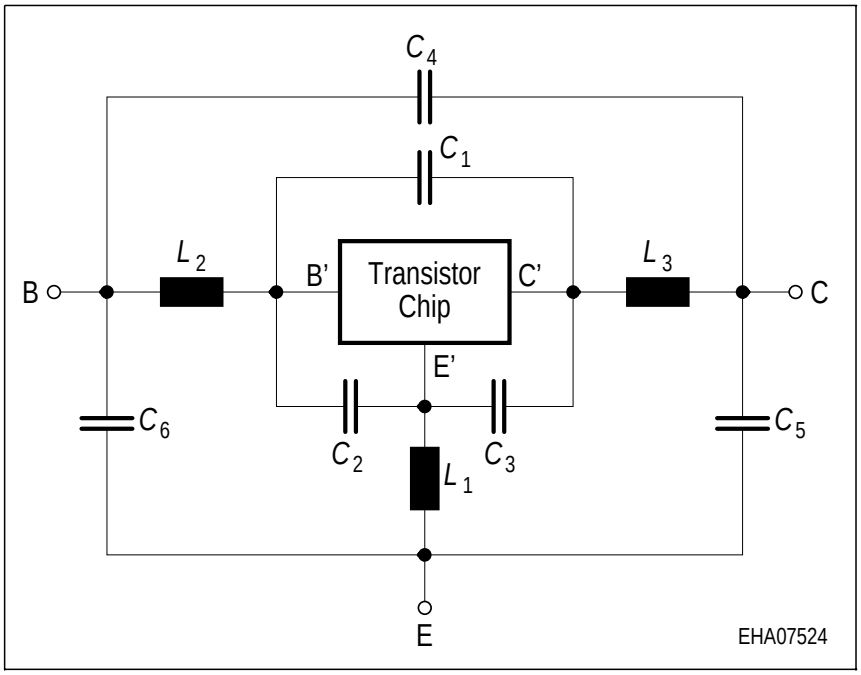
SPICE Parameter (Gummel-Poon Model, Berkley-SPICE 2G.6 Syntax):

Transistor Chip Data:

IS =	4.36	fA	BF =	120	-	NF =	1.085	-
VAF =	30	V	IKF =	0.152	mA	ISE =	1.86	pF
NE =	1.998	-	BR =	33.322	-	NR =	1.095	-
VAR =	41.889	V	IKR =	0.063	A	ISC =	3.68	pA
NC =	1.569	-	RB =	20.766	Ω	IRB =	72.2	mA
RBM =	0.823	Ω	RE =	0.101	-	RC =	0.849	Ω
CJE =	291	fF	VJE =	0.568	V	MJE =	0.456	-
TF =	8.77	ps	XTF =	0.00894	-	VTF =	0.198	V
ITF =	1.336	mA	PTF =	0	deg	CJC =	459	fF
VJC =	1.048	V	MJC =	0.334	-	XCJC =	0.217	-
TR =	1.39	ns	CJS =	0	fF	VJS =	0.75	V
MJS =	0	-	NK =	0.5	-	EG =	1.11	eV
.	-	-	FC =	0.924		TNOM	300	K

All parameters are ready to use, no scalling is necessary. Extracted on behalf of Infineon Technologies AG by: Institut für Mobil- und Satellitentechnik (IMST)

Package Equivalent Circuit:

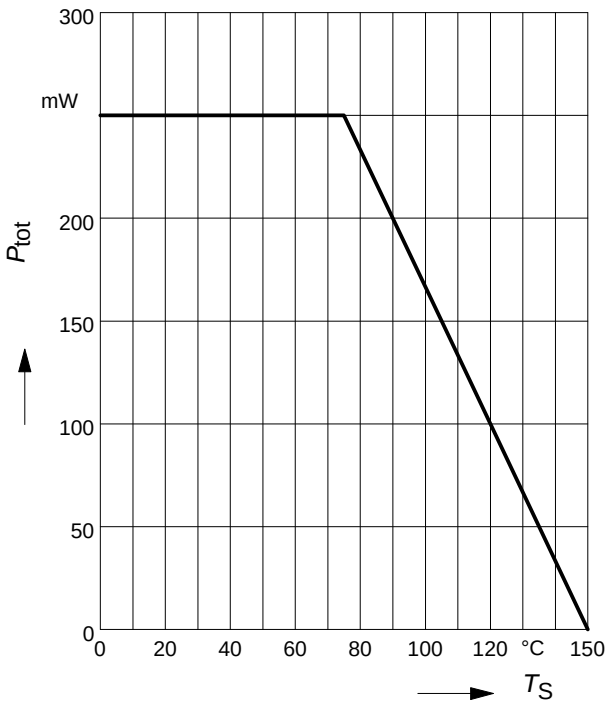


L_1 =	0.762	nH
L_2 =	0.706	nH
L_3 =	0.382	nH
C_1 =	62	fF
C_2 =	84	fF
C_3 =	180	fF
C_4 =	7	fF
C_5 =	40	fF
C_6 =	48	fF

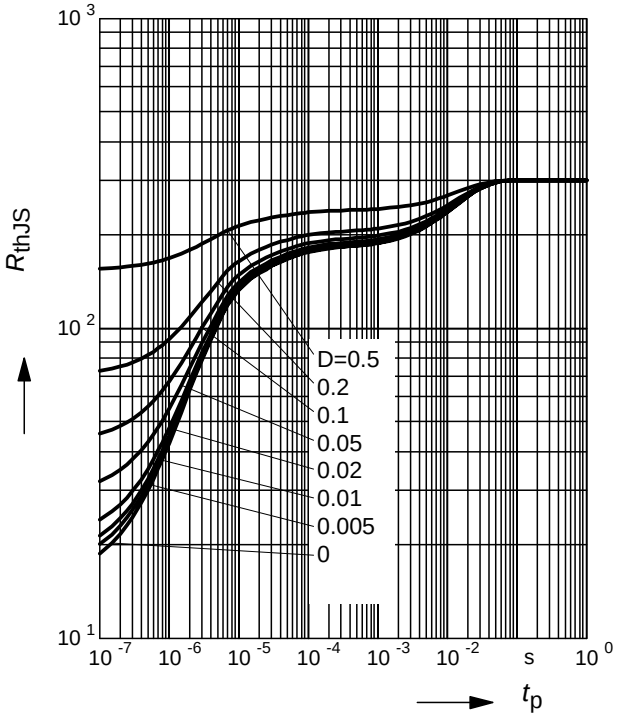
Valid up to 6GHz

For examples and ready to use parameters please contact your local Infineon Technologies distributor or sales office to obtain a Infineon Technologies CD-ROM or see Internet: http://www.infineon.com

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

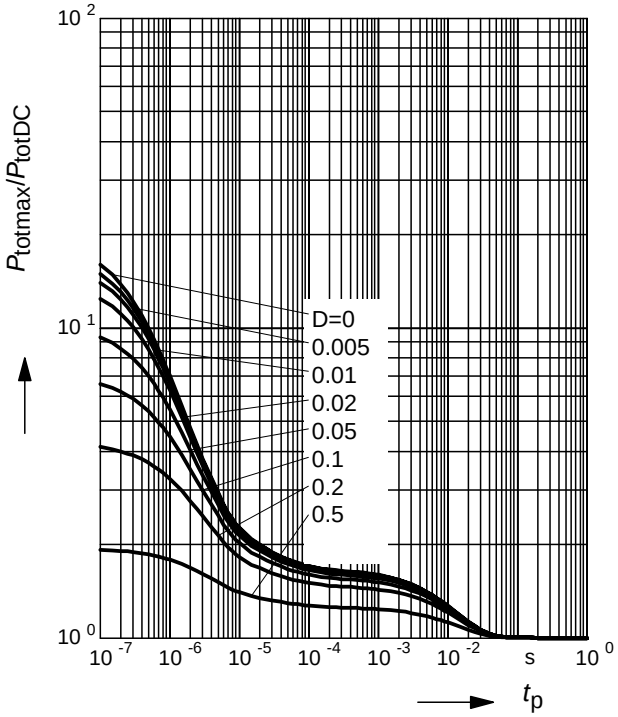


Permissible Pulse Load $R_{thJS} = f(t_p)$



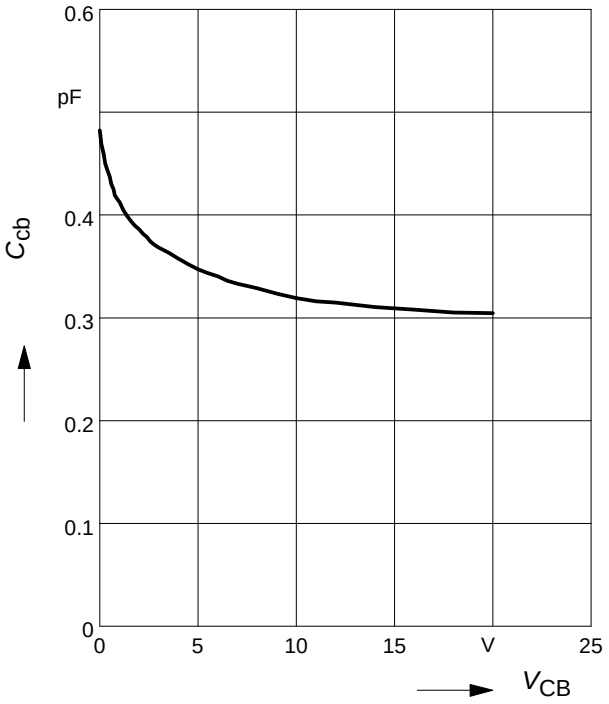
Permissible Pulse Load

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



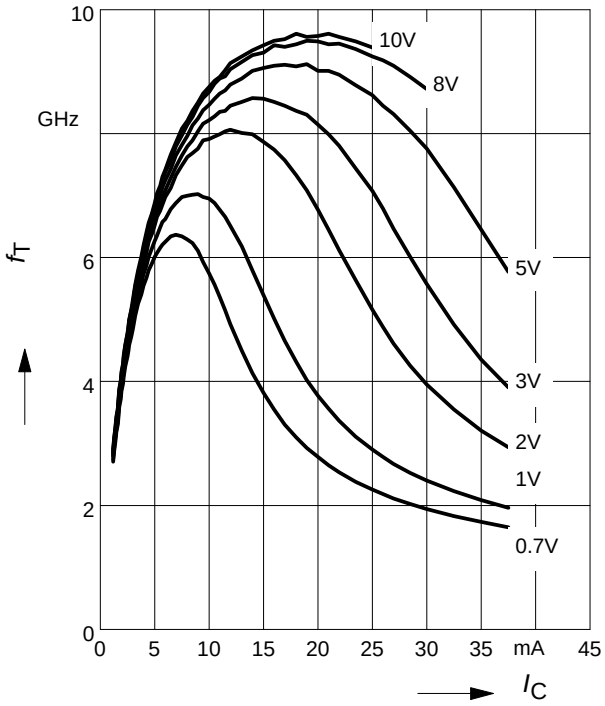
Collector-base capacitance $C_{cb} = f(V_{CB})$

f = 1MHz



Transition frequency $f_T = f(I_C)$

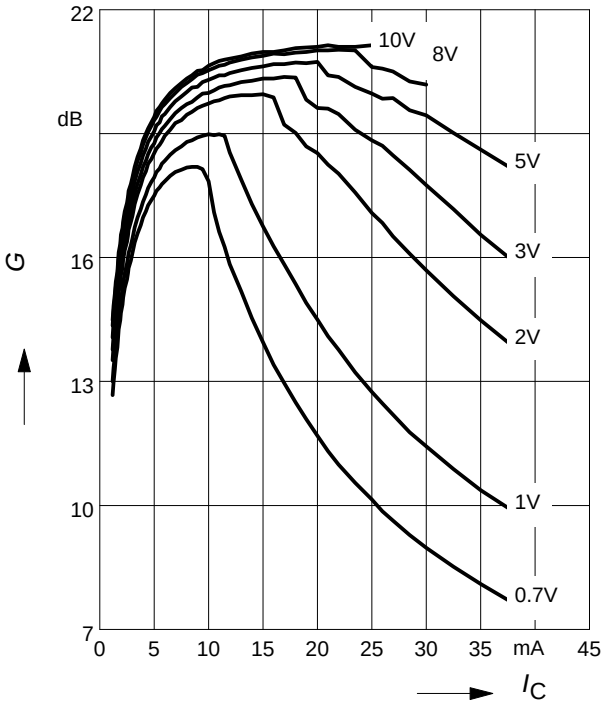
V_{CE} = parameter



Power gain G_{ma}, $G_{ms} = f(I_C)$

f = 0.9GHz

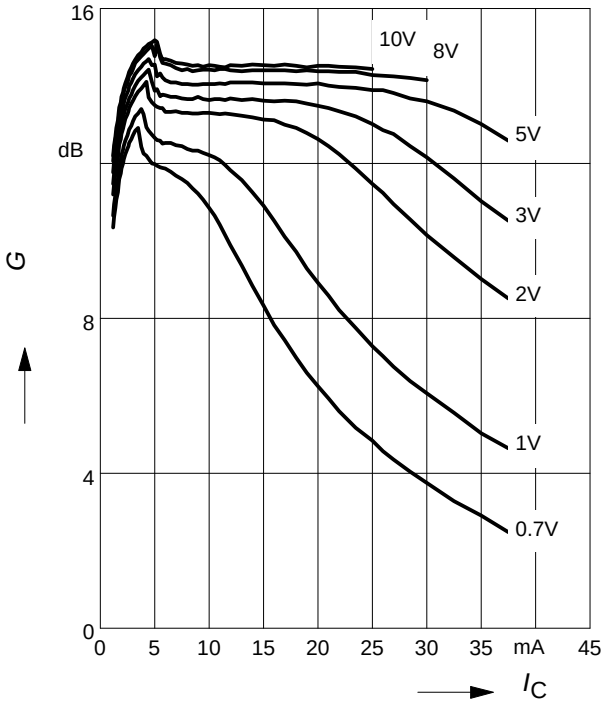
V_{CE} = parameter



Power gain G_{ma}, $G_{ms} = f(I_C)$

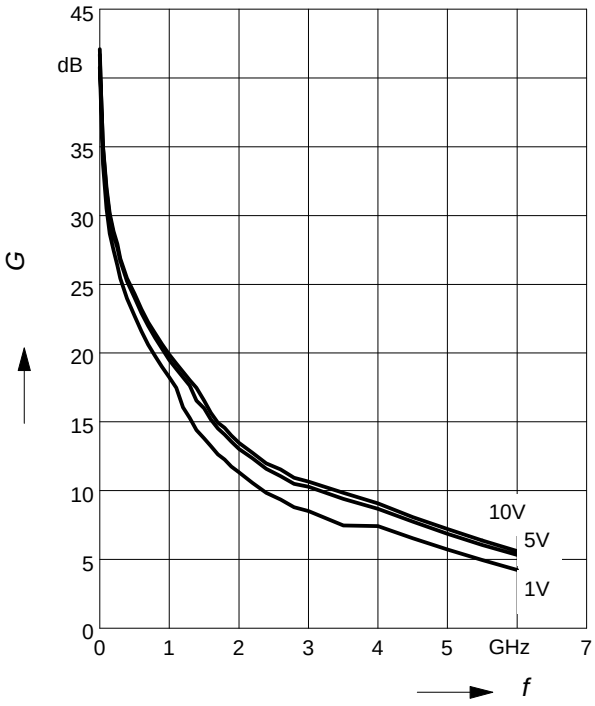
f = 1.8GHz

V_{CE} = parameter



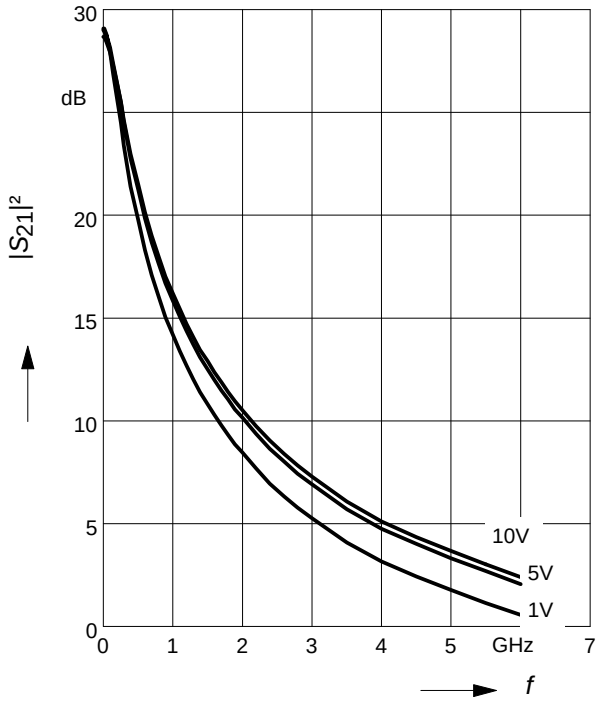
Power Gain G_{ma}, $G_{ms} = f(f)$

V_{CE} = parameter, I_C = 10 mA



Power Gain $|S_{21}|^2 = f(f)$

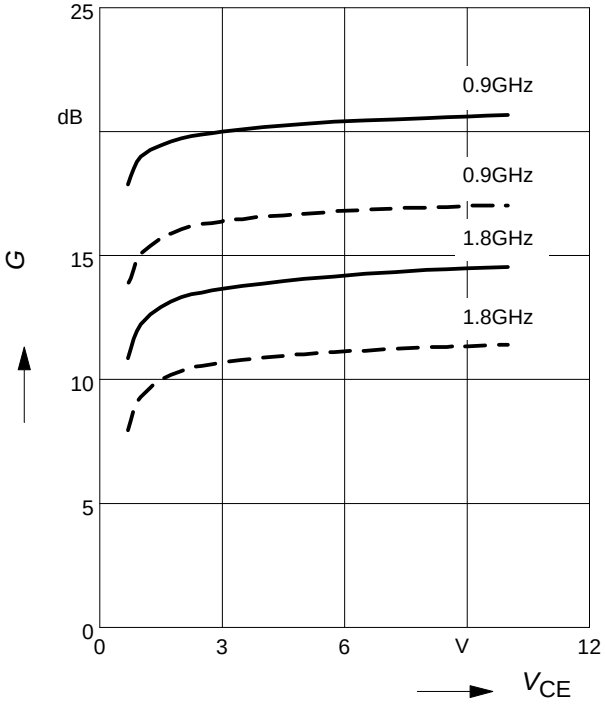
V_{CE} = parameter, I_C = 10 mA



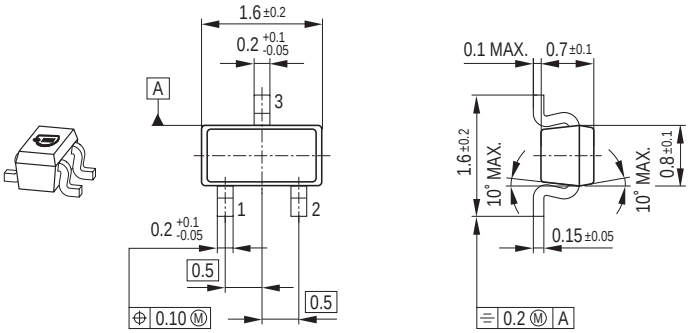
Power Gain G_{ma}, $G_{ms} = f(V_{CE})$: ——

$|S_{21}|^2 = f(V_{CE})$: - - - -

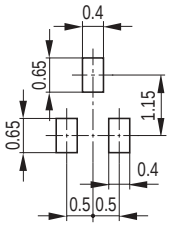
f = parameter, I_C = 10 mA



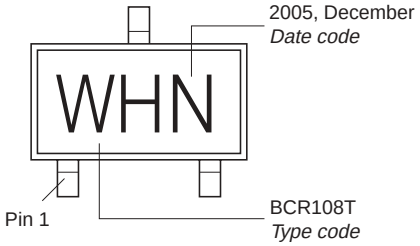
Package Outline



Foot Print

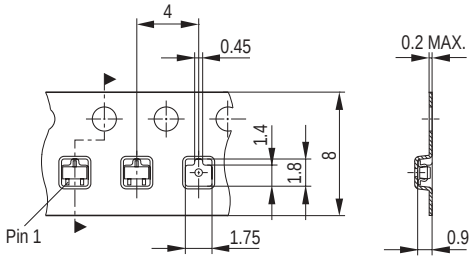


Marking Layout (Example)



Standard Packing

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



Date Code marking for discrete packages with one digit (SCD80, SC79, SC75[1]) CES-Code

Month	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
01	a	p	A	P	a	p	A	P	a	p	A	P
02	b	q	B	Q	b	q	B	Q	b	q	B	Q
03	c	r	C	R	c	r	C	R	c	r	C	R
04	d	s	D	S	d	s	D	S	d	s	D	S
05	e	t	E	T	e	t	E	T	e	t	E	T
06	f	u	F	U	f	u	F	U	f	u	F	U
07	g	v	G	V	g	v	G	V	g	v	G	V
08	h	x	H	X	h	x	H	X	h	x	H	X
09	j	y	J	Y	j	y	J	Y	j	y	J	Y
10	k	z	K	Z	k	z	K	Z	k	z	K	Z
11	l	2	L	4	l	2	L	4	l	2	L	4
12	n	3	N	5	n	3	N	5	n	3	N	5

1) New Marking Layout for SC75, implemented at October 2005.

Edition 2006-02-01
Published by
Infineon Technologies AG
81726 München, Germany

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