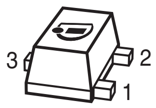
Low Noise Silicon Bipolar RF Transistor



- Low noise amplifier for low current applications
- Collector design supports 5 V supply voltage
- For oscillators up to 3.5 GHz
- Low noise figure 1.0 dB at 1.8 GHz
- Pb-free (RoHS compliant) and halogen-free thin small flat package with visible leads
- Qualification report according to AEC-Q101 available

RoHS HAL

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

Type	Marking	Pin Configuration			Package
BFR360F	FBs	1 = B	2 = E	3 = C	TSFP-3

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

Parameter	Symbol	Value	Unit
Collector-emitter voltage	V_{CEO}	6	V
Collector-emitter voltage	V_{CES}	15	
Collector-base voltage	V_{CBO}	15	
Emitter-base voltage	V_{EBO}	2	
Collector current	I_C	35	mA
Base current	I_B	4	
Total power dissipation[1)] $T_S \le 98°C$	P_{tot}	210	mW
Junction temperature	T_J	150	°C
Storage temperature	T_{Stg}	-55 ... 150	

Thermal Resistance

Parameter	Symbol	Value	Unit
Junction - soldering point[2)]	R_{thJS}	250	K/W

[1] T_S is measured on the collector lead at the soldering point to the pcb

[2] For the definition of R_{thJS} please refer to Application Note AN077 (Thermal Resistance Calculation)

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	$V_{(BR)CEO}$	6	9	-	V
Collector-emitter cutoff current V_{CE} = 4 V, V_{BE} = 0 V_{CE} = 10 V, V_{BE} = 0, T_A = 85°C Verified by random sampling	I_{CES}	 - -	 1 2	 30 50	nA
Collector-base cutoff current V_{CB} = 4 V, I_E = 0	I_{CBO}	-	1	30	
Emitter-base cutoff current V_{EB} = 1 V, I_C = 0	I_{EBO}	-	1	500	
DC current gain I_C = 15 mA, V_{CE} = 3 V, pulse measured	h_{FE}	90	120	160	-

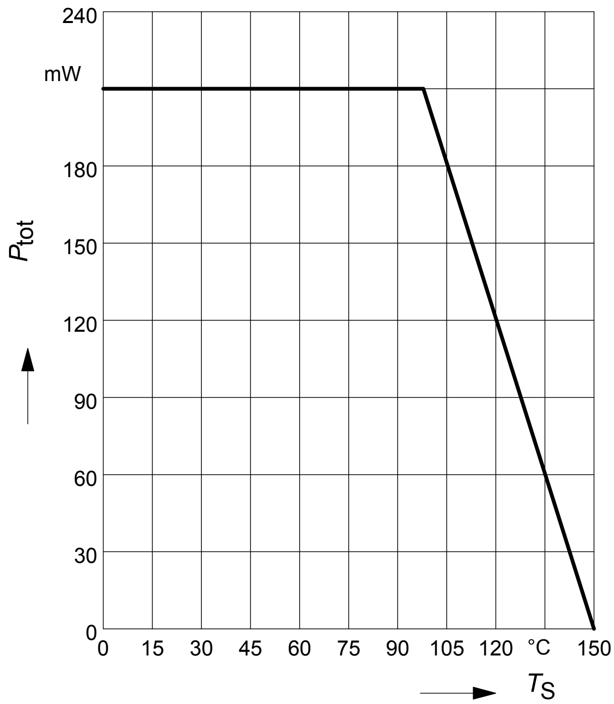
Electrical Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics (verified by random sampling)					
Transition frequency I_C = 15 mA, V_{CE} = 3 V, f = 1 GHz	f_T	11	14	-	GHz
Collector-base capacitance V_{CB} = 5 V, f = 1 MHz, V_{BE} = 0 , emitter grounded	C_{cb}	-	0.32	0.5	pF
Collector emitter capacitance V_{CE} = 5 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}	-	0.4	-	
Minimum noise figure I_C = 3 mA, V_{CE} = 3 V, $Z_S = Z_{Sopt}$, f = 1.8 GHz	NF_{min}	-	1	-	dB
Power gain, maximum available[1)] I_C = 15 mA, V_{CE} = 3 V, $Z_S = Z_{Sopt}$, $Z_L = Z_{Lopt}$, f = 1.8 GHz f = 3 GHz	G_{ma}	 - -	 15.5 11	 - -	
Transducer gain I_C = 15 mA, V_{CE} = 3 V, $Z_S = Z_L$ = 50Ω, f = 1.8 GHz f = 3 GHz	$\|S_{21e}\|^2$	 - -	 13 9	 - -	dB
Third order intercept point at output[2)] V_{CE} = 3 V, I_C = 15 mA, f = 1.8 GHz, $Z_S = Z_L$ = 50Ω	$IP3$	-	24	-	dBm
1dB compression point at output I_C = 15 mA, V_{CE} = 3 V, $Z_S = Z_L$ = 50Ω, f = 1.8 GHz	P_{-1dB}	-	9	-	

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

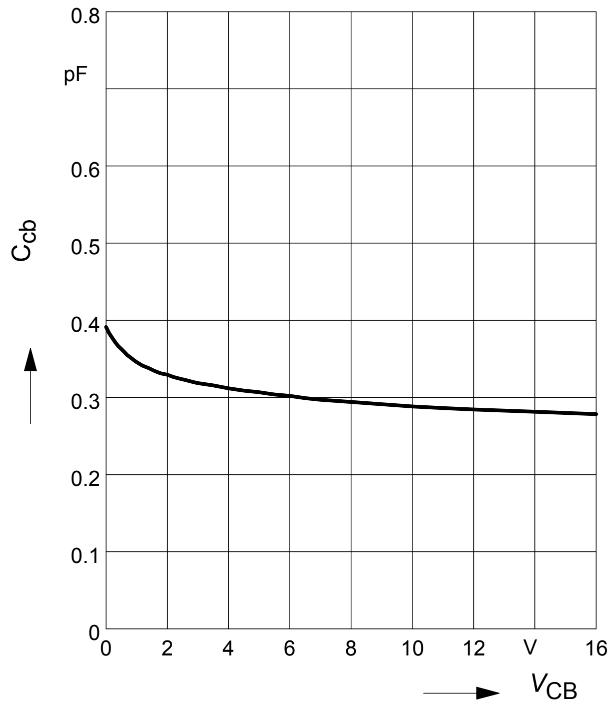
[2] IP3 value depends on termination of all intermodulation frequency components.
Termination used for this measurement is 50Ω from 0.1 MHz to 6 GHz

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



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

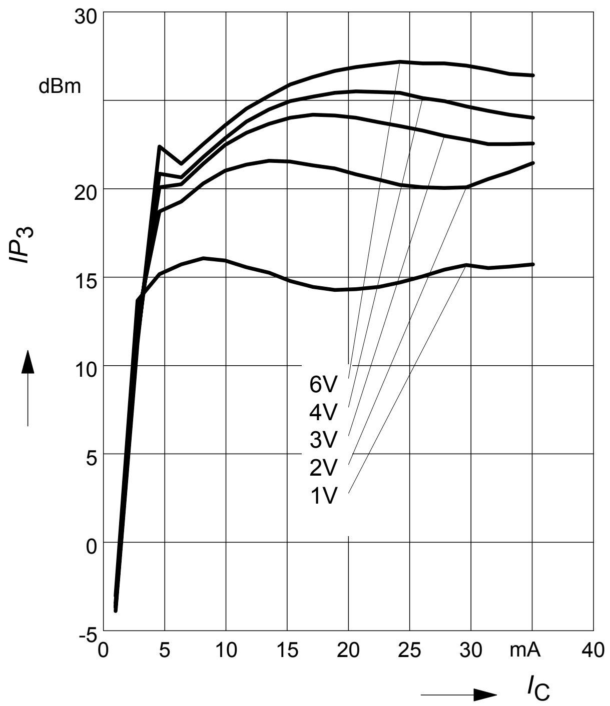
f = 1MHz



Third order Intercept Point $IP_3 = f(I_C)$

(Output, $Z_S = Z_L = 50\Omega$)

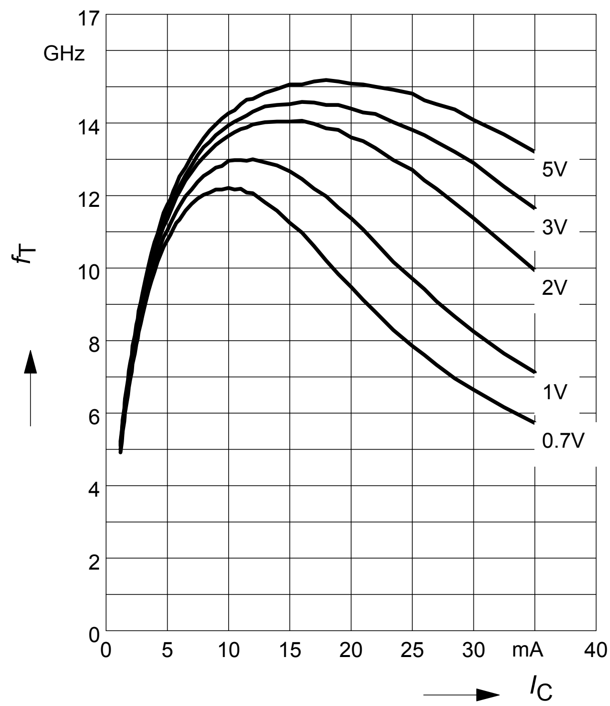
V_{CE} = parameter, f = 1.8GHz



Transition frequency $f_T = f(I_C)$

f = 1GHz

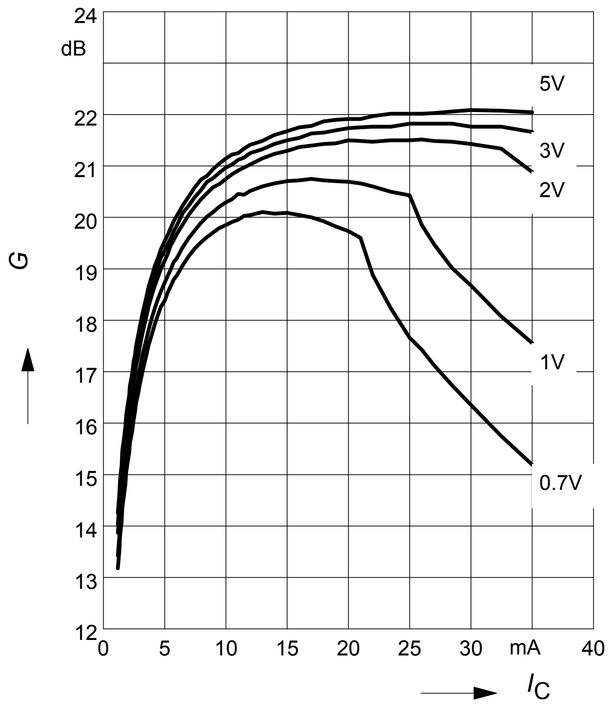
V_{CE} = parameter



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

f = 0.9GHz

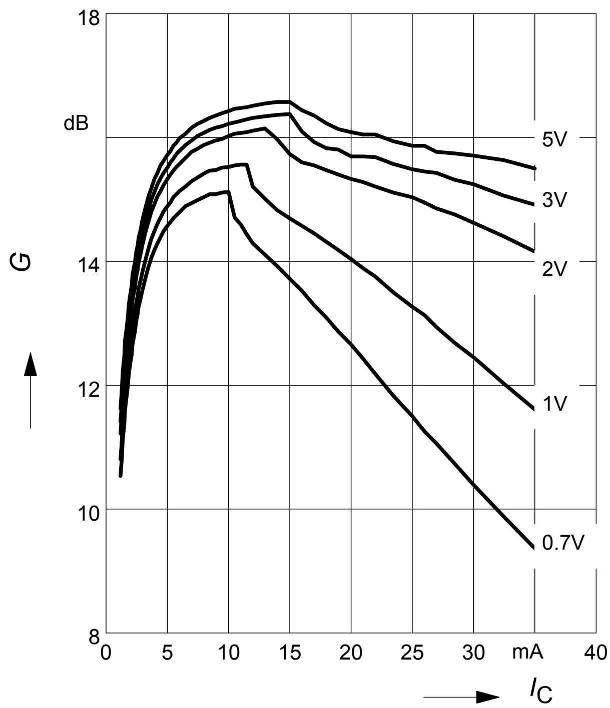
V_{CE} = parameter



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

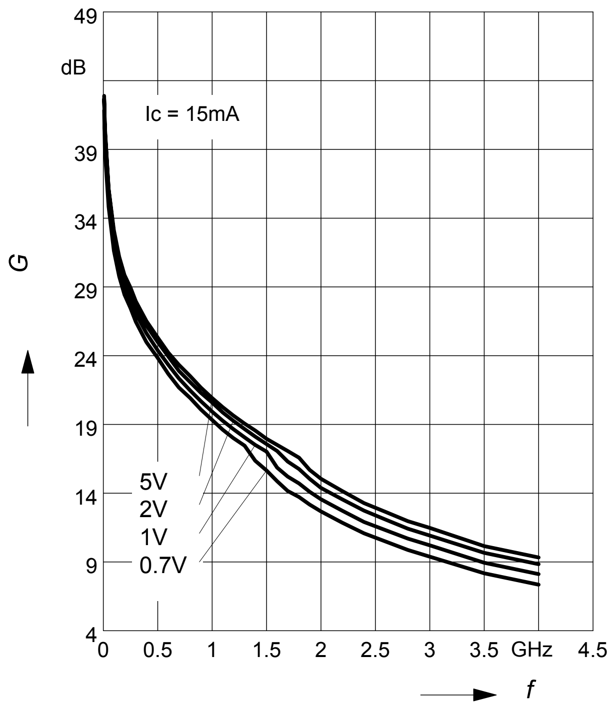
f = 1.8GHz

V_{CE} = parameter



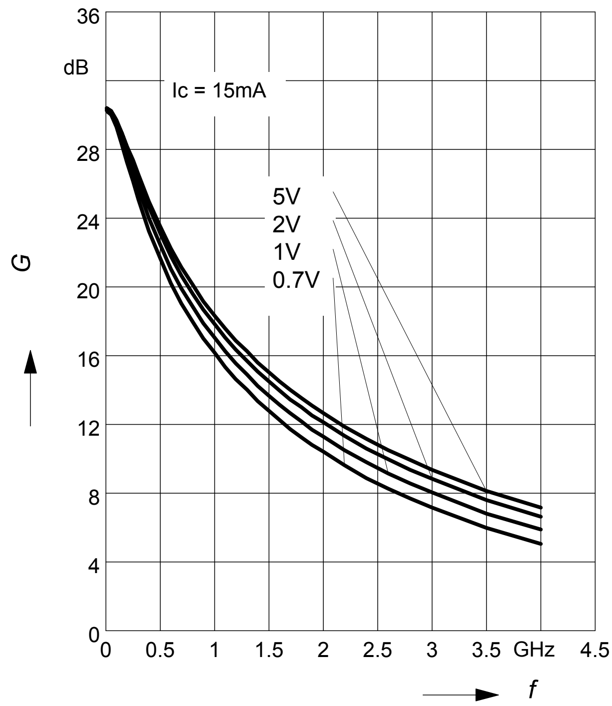
Power Gain G_{ma}, G_{ms} = $f(f)$

V_{CE} = parameter

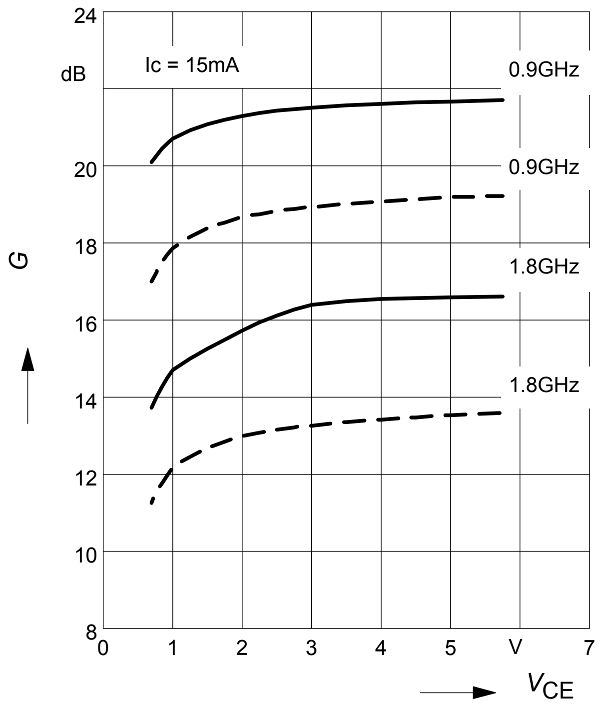


Insertion Power Gain $|S_{21}|^2$ = $f(f)$

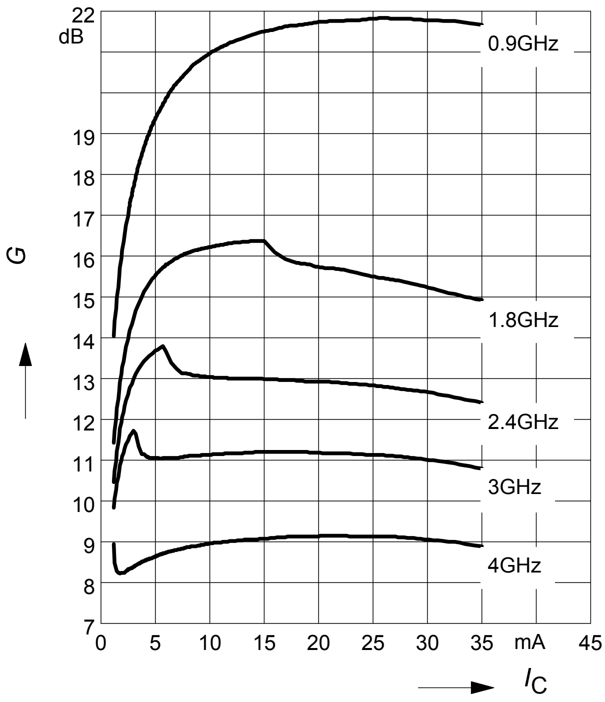
V_{CE} = parameter



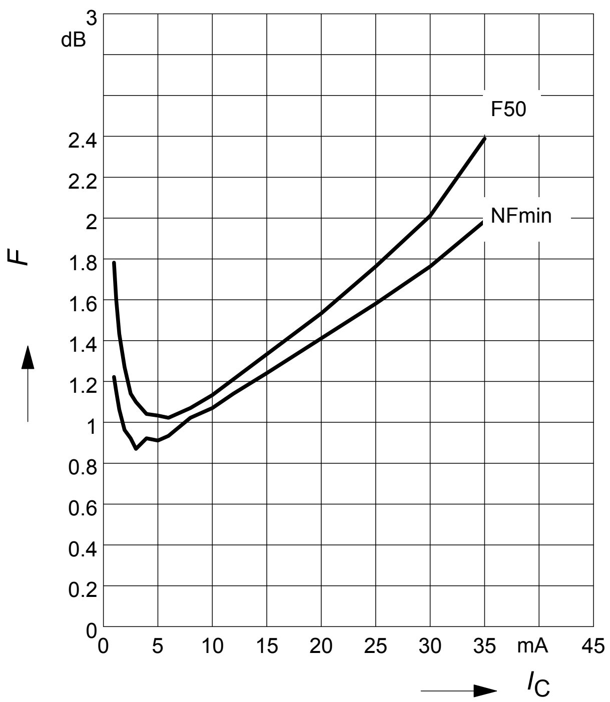
Power Gain G_{ma}, G_{ms} = $f(V_{CE})$: ——
$|S_{21}|^2$ = $f(V_{CE})$: - - - -
f = parameter



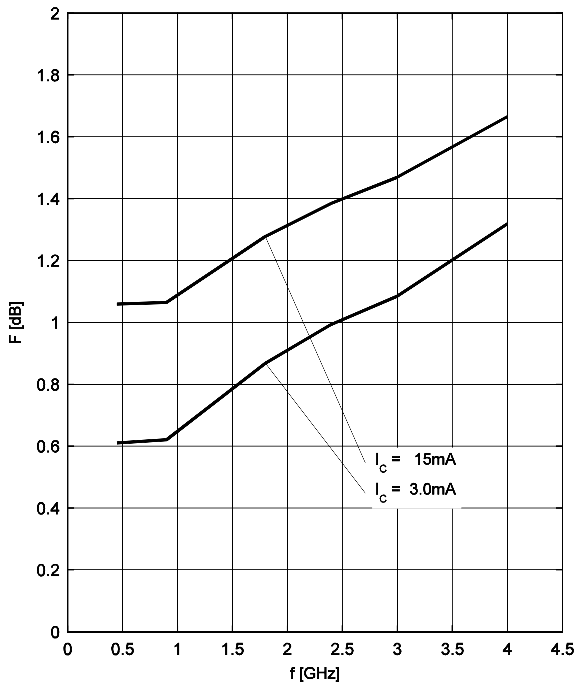
Power gain G_{ma}, G_{ms} = f (I_C)
V_{CE} = 3V
f = parameter



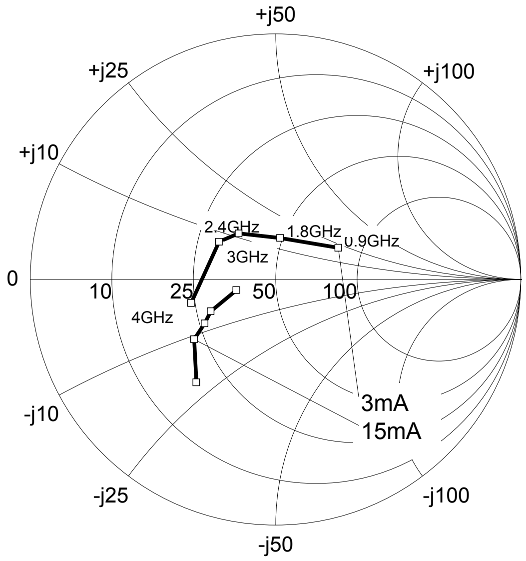
Noise figure NF = f (I_C)
V_{CE} = 3V, f = 1,8 GHz



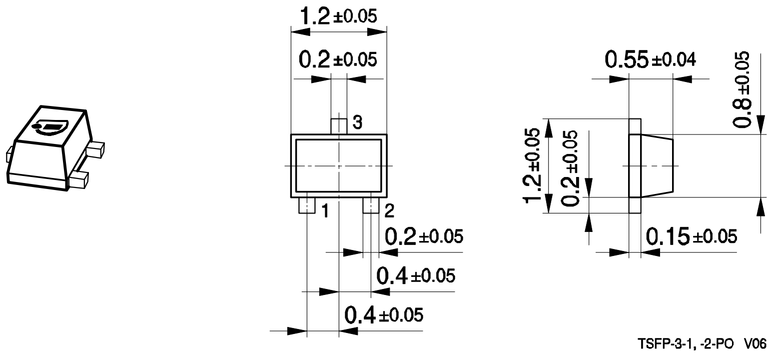
Noise figure F = $f(f)$
V_{CE} = 3V, Z_S = Z_{Sopt}



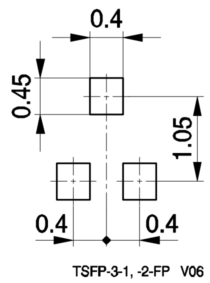
Source impedance for min.
noise figure vs. frequency
V_{CE} = 3 V



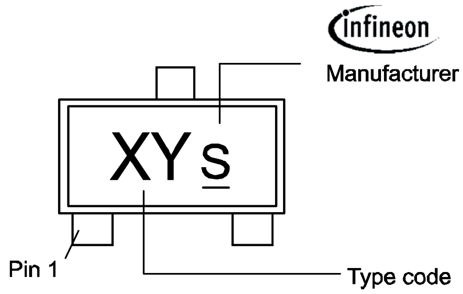
Package Outline



Foot Print

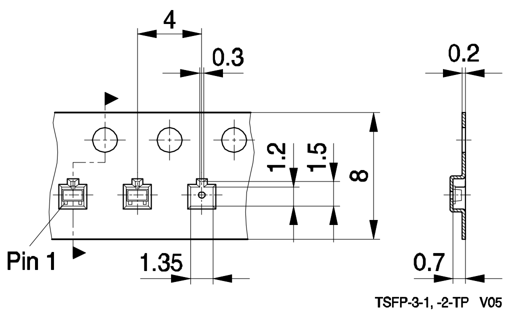


Marking Layout (Example)



Standard Packing

Reel Ø 180 mm = 3.000 Pieces/Reel
Reel Ø 330 mm = 10.000 Pieces/Reel



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