19 PARTS LIST

General Purpose Transistor
(–50V, –0.15A)
2SA1037AK / 2SA1576A / 2SA1774 / 2SA1774H / 2SA933AS

●Features

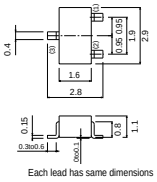
1) Excellent h_{FE} linearity.
2) Complements the 2SC2412K / 2SC4081 / 2SC4617 / 2SC4617H / 2SC1740S.

●Structure

Epitaxial planar type.
PNP silicon transistor

●External dimensions (Units : mm)

2SA1037AK



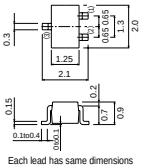
Each lead has same dimensions

ROHM : SMT3
EIAJ : SC-59

(1) Emitter
(2) Base
(3) Collector

Abbreviated symbol : F ∗

2SA1576A



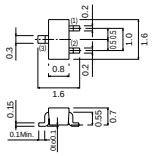
Each lead has same dimensions

ROHM : UMT3
EIAJ : SC-70

(1) Emitter
(2) Base
(3) Collector

Abbreviated symbol : F ∗

2SA1774

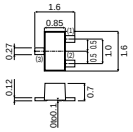


ROHM : EMT3
EIAJ : SC-75A

(1) Emitter
(2) Base
(3) Collecto

Abbreviated symbol : F ∗

2SA1774H

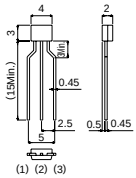


ROHM : EMT3 Flat lead
EIAJ : SC-89

(1) Emitter
(2) Base
(3) Collector

Abbreviated symbol : F ∗

2SA933AS



Taping specifications

ROHM : SPT
EIAJ : SC-72

(1) Emitter
(2) Collector
(3) Base

∗ Denotes h_{FE}

● **Absolute maximum ratings** (Ta=25°C)

Parameter		Symbol	Limits	Unit
Collector-base voltage		V_{CBO}	–60	V
Collector-emitter voltage		V_{CEO}	–50	V
Emitter-base voltage		V_{EBO}	–6	V
Collector current		I_C	–0.15	A (DC)
Collector power dissipation	2SA1037AK, 2SA1576A	P_C	0.2	W
	2SA1774H, 2SA1774		0.15	
	2SA933AS		0.3	
Junction temperature		Tj	150	˚C
Storage temperature		Tstg	–55~+150	˚C

● **Electrical characteristics** (Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	–60	-	-	V	I_C=–50μA
Collector-emitter breakdown voltage	BV_{CEO}	–50	-	-	V	I_C=–1μA
Emitter-base breakdown voltage	BV_{EBO}	–6	-	-	V	I_E=–50μA
Collector cutoff current	I_{CBO}	-	-	–0.1	μA	V_{CB}=–60V
Emitter cutoff current	I_{EBO}	-	-	–0.1	μA	V_{EB}=–6V
Collector-emitter saturation voltage	$V_{CE(sat)}$	-	-	–0.5	V	I_C/I_B=–50mA/–5mA
DC current transfer ratio	h_{FE}	120	-	560	-	V_{CE}=–6V, I_C=–1mA
Transition frequency	f_T	-	140	-	MHz	V_{CE}=–12V, I_E=2mA, f=30MHz
Output capacitance	Cob	-	4.0	5.0	pF	V_{CB}=–12V, I_E=0A, f=1MHz

● **Packaging specifications and h_{FE}**

Type	h_{FE}	Package	Taping				
		Code	T146	T106	TL	T2L	TP
		Basic ordering unit (pieces)	3000	3000	3000	8000	5000
2SA1037AK	QRS		○	-	-	-	-
2SA1576A	QRS		-	○	-	-	-
2SA1774	QRS		-	-	○	-	-
2SA1774H	QRS		-	-	-	○	-
2SA933AS	QRS		-	-	-	-	○

h_{FE} values are classified as follows:

Item	Q	R	S
h_{FE}	120~270	180~390	270~560

●Electrical characteristic curves

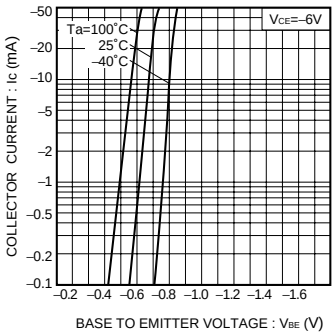


Fig.1 Grounded emitter propagation characteristics

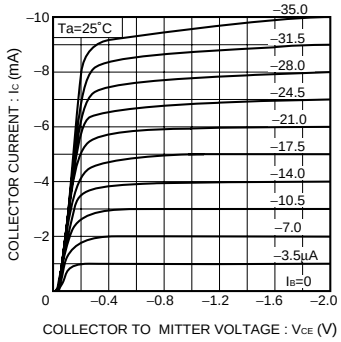


Fig.2 Grounded emitter output characteristics (I)

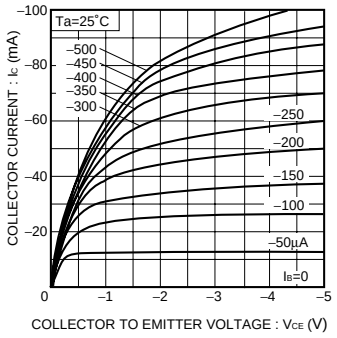


Fig.3 Grounded emitter output characteristics (II)

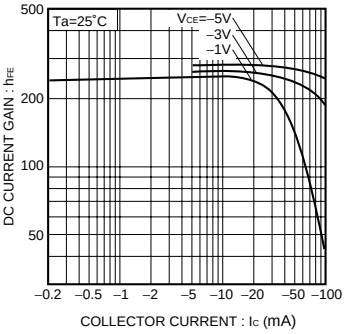


Fig.4 DC current gain vs. collector current (I)

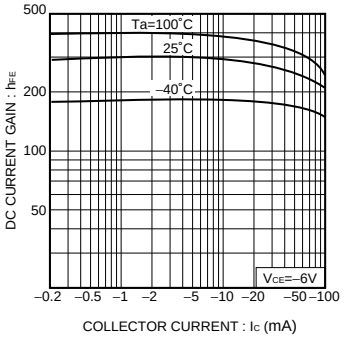


Fig.5 DC current gain vs. collector current (II)

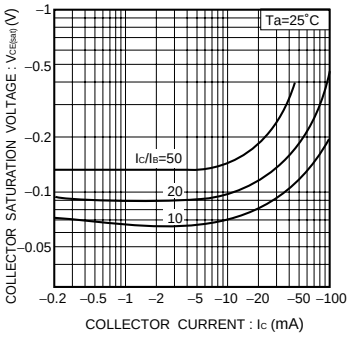


Fig.6 Collector-emitter saturation voltage vs. collector current (I)

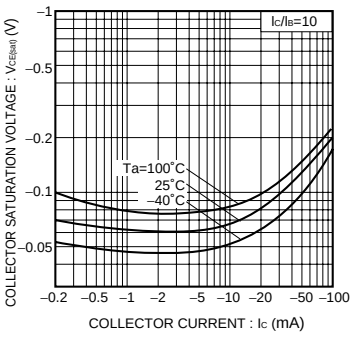


Fig.7 Collector-emitter saturation voltage vs. collector current (II)

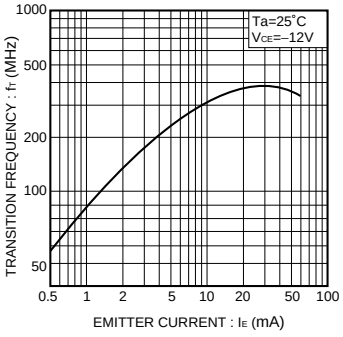


Fig.8 Gain bandwidth product vs. emitter current

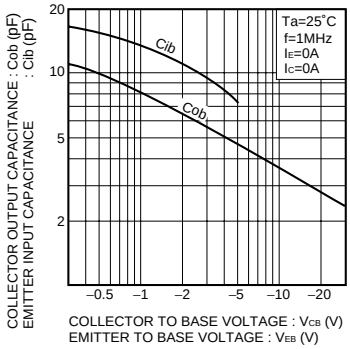


Fig.9 Collector output capacitance vs. collector-base voltage
Emitter inputcapacitance vs. emitter-base voltage

Low Frequency Transistor (−32V, −0.8A)

2SB1197K

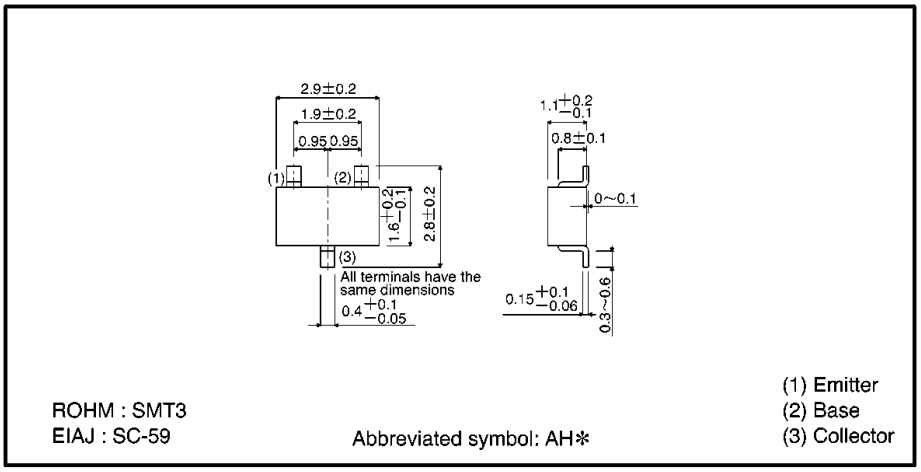
●Features

1) Low $V_{CE(sat)}$.
   $V_{CE(sat)} \leqq -0.5V$
   ($I_C / I_B = -0.5A / -50mA$)
2) $I_C = -0.8A$.
3) Complements the 2SD1781K.

●Structure

Epitaxial planar type
PNP silicon transistor

●External dimensions (Units: mm)



●Absolute maximum ratings (Ta = 25°C) * Denotes h_{FE}

Parameter	Symbol	Limits	Unit
Collector-base voltage	V_{CBO}	−40	V
Collector-emitter voltage	V_{CEO}	−32	V
Emitter-base voltage	V_{EBO}	−5	V
Collector current	I_C	−0.8	A
Collector power dissipation	P_C	0.2	W
Junction temperature	Tj	150	℃
Storage temperature	Tstg	−55～+150	℃

●Electrical characteristics (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	−40	—	—	V	I_C=−50 μA
Collector-emitter breakdown voltage	BV_{CEO}	−32	—	—	V	I_C=−1mA
Emitter-base breakdown voltage	BV_{EBO}	−5	—	—	V	I_E=−50 μA
Collector cutoff current	I_{CBO}	—	—	−0.5	μA	V_{CB}=−20V
Emitter cutoff current	I_{EBO}	—	—	−0.5	μA	V_{EB}=−4V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	—	−0.5	V	I_C/I_B=−0.5A/−50mA
DC current transfer ratio	h_{FE}	120	—	390	—	V_{CE}=−3V, I_C=−100mA
Transition frequency	f_T	50	200	—	MHz	V_{CE}=−5V, I_E=50mA, f=100MHz
Output capacitance	Cob	—	12	30	pF	V_{CB}=−10V, I_E=0A, f=1MHz

(96-134-B92)

●Packaging specifications and h_{FE}

Type	h_{FE}	Package	Taping
		Code	T146
		Basic ordering unit (pieces)	3000
2SB1197K	QR		○

h_{FE} values are classified as follows :

Item	Q	R
h_{FE}	120～270	180～390

●Electrical characteristic curves

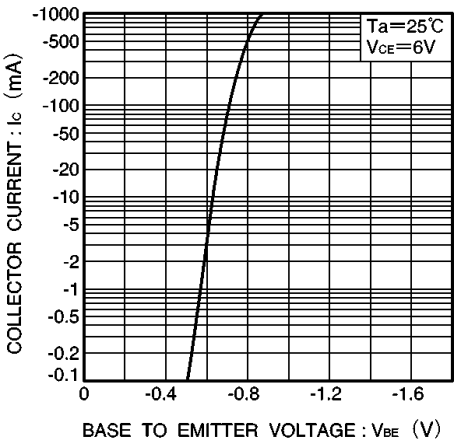


Fig.1 Grounded emitter propagation characteristics

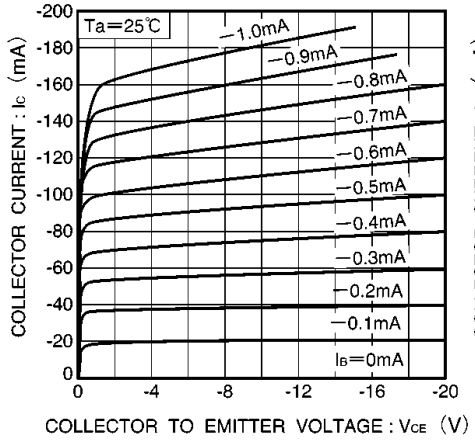


Fig.2 Grounded emitter output characteristics (Ⅰ)

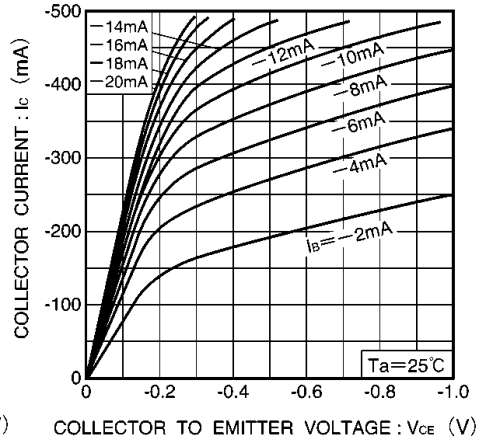


Fig.3 Grounded emitter output characteristics (Ⅱ)

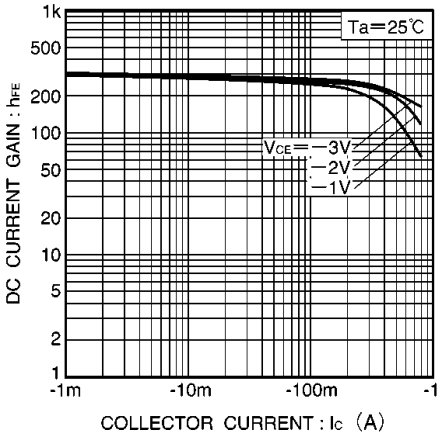


Fig.4 DC current gain vs. collector current

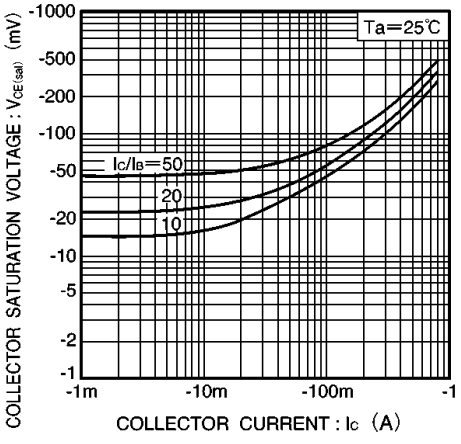


Fig.5 Collector-emitter saturation voltage vs. collector current

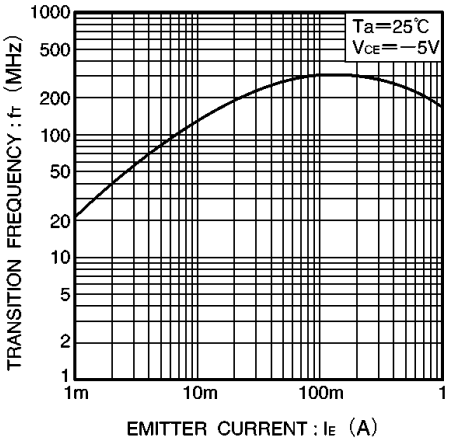


Fig.6 Gain bandwidth product vs. emitter current

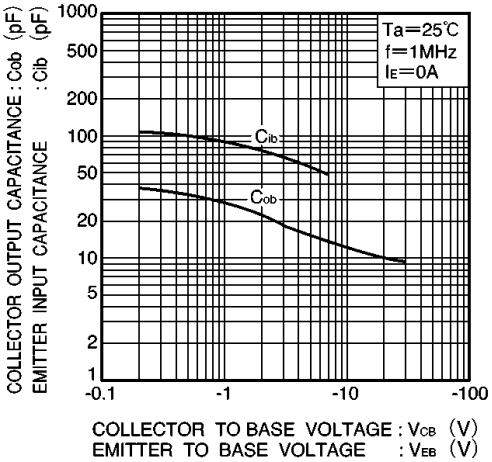


Fig.7 Collector output capacitance vs. collector-base voltage
Emitter input capacitance vs. emitter-base voltage

Power Transistor (−50V, −2A)

2SA1797 / 2SB1443

●Features

1) Low saturation voltage, $V_{CE(sat)}$ = −0.35V (Max.) at I_C / I_B = −1A / −50mA.
2) Excellent DC current gain characteristics.
3) Complements the 2SA1797 and 2SC4672.

●Packaging specifications and h_{FE}

Type	2SA1797	2SB1443
Package	MPT3	ATV
h_{FE}	PQ	Q
Marking	AG*	—
Code	T100	TV2
Basic ordering unit (pieces)	1000	2500

* Denotes h_{FE}

●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit	
Collector-base voltage		V_{CBO}	−50	V	
Collector-emitter voltage		V_{CEO}	−50	V	
Emitter-base voltage		V_{EBO}	−6	V	
Collector current		I_C	−2	A (DC)	
			−5	A (Pulse)	*1
Collector power dissipation	2SA1797	P_C	0.5	W	
			2		*2
	2SB1443		1		*3
Junction temperature		Tj	150	℃	
Storage temperature		Tstg	−55～+150	℃	

*1 Single pulse Pw=10ms
*2 When mounted on a 40×40×0.7mm ceramic board.
*3 Printed circuit board 1.7mm thick, collector plating 1cm² or larger.

●Electrical characteristics (Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage		BV_{CBO}	−50	—	—	V	I_C=−50μA
Collector-emitter breakdown voltage		BV_{CEO}	−50	—	—	V	I_C=−1mA
Emitter-base breakdown voltage		BV_{EBO}	−6	—	—	V	I_E=−50μA
Collector cutoff current		I_{CBO}	—	—	−0.1	μA	V_{CB}=−50V
Emitter cutoff current		I_{EBO}	—	—	−0.1	μA	V_{EB}=−5V
Collector-emitter saturation voltage		$V_{CE(sat)}$	—	−0.15	−0.35	V	I_C/I_B=−1A/−50mA *
DC current transfer ratio	2SA1797	h_{FE}	82	—	270	—	V_{CE}/I_C=−2V/−0.5A
	2SB1443		120	—	270	—	
Transition frequency		f_T	—	200	—	MHz	V_{CE}=−2V, I_E=0.5A, f=100MHz *
Output capacitance		Cob	—	36	—	pF	V_{CB}=−10V, I_E=0A, f=1MHz

* Measured using pulse current.

(96-100-B208)

Low Frequency Transistor (50V, 2A)

2SC4672

●Features

1) Low saturation voltage, typically $V_{CE(sat)}$ = 0.1V at I_C / I_B = 1A / 50mA.
2) Excellent DC current gain characteristics.
3) Complements the 2SA1797.

●Packaging specifications and h_{FE}

Type	2SC4672
Package	MPT3
h_{FE}	PQ
Marking	DK*
Code	T100
Basic ordering unit (pieces)	1000

* Denotes h_{FE}

●Absolute maximum ratings (Ta=25℃)

Parameter	Symbol	Limits	Unit	
Collector-base voltage	V_{CBO}	60	V	
Collector-emitter voltage	V_{CEO}	50	V	
Emitter-base voltage	V_{EBO}	6	V	
Collector current	I_C	2	A (DC)	
		5	A (Pulse)	*
Collector power dissipation	P_C	0.5	W	
Junction temperature	Tj	150	℃	
Storage temperature	Tstg	−55～+150	℃	

* Single pulse, Pw=10ms

●Electrical characteristics (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Collector-base breakdown voltage	BV_{CBO}	60	—	—	V	I_C=50μA
Collector-emitter breakdown voltage	BV_{CEO}	50	—	—	V	I_C=1mA
Emitter-base breakdown voltage	BV_{EBO}	6	—	—	V	I_E=50μA
Collector cutoff current	I_{CBO}	—	—	0.1	μA	V_{CB}=60V
Emitter cutoff current	I_{EBO}	—	—	0.1	μA	V_{EB}=5V
Collector-emitter saturation voltage	$V_{CE(sat)}$	—	0.1	0.35	V	I_C/I_B=1A/50mA *
DC current transfer ratio	h_{FE}	82	—	270	—	V_{CE}=2V, I_C=0.5A *
Transition frequency	f_T	—	210	—	MHz	V_{CE}=2V, I_E=−0.5A, f=100MHz
Output capacitance	Cob	—	25	—	pF	V_{CB}=10V, I_E=0A, f=1MHz

* Measured using pulse current.

(96-181-D208)

NEC

SILICON TRANSISTOR
2SC5289

NPN SILICON EPITAXIAL TRANSISTOR FOR L-BAND LOW-POWER AMPLIFIER

The 2SC5289 is ideal for the final stage amplifier in 1.9G Hz-band digital cordless phones (DECT, PHS, etc.).

FEATURES

- P_{-1} = 27 dBm TYP.
  @f = 1.9 GHz, V_{CC} = 3.6 V, I_{Cq} = 1 mA (Class AB), Duty = 1/8
- 4-Pin Mini Mold Package
  EIAJ: SC-61

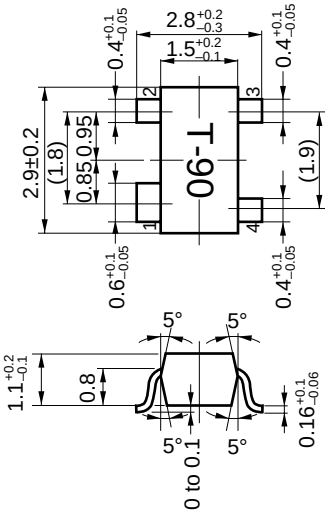
ORDERING INFORMATION

Part Number	Quantity	Packing Style
2SC5289-T1	3 Kpcs/Reel	Embossed tape 8 mm wide. Pin 3 (Base), Pin 4 (Emitter) face to perforation side of the tape.

Remark If you require an evaluation sample, please contact an NEC Sales Representative. (Unit sample quantity is 50 pcs.)

PACKAGE DRAWING

(Unit: mm)



PIN CONNECTIONS
1. Collector
2. Emitter
3. Base
4. Emitter

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

Parameter	Symbol	Rating	Unit
Collector to Base Voltage	V_{CBO}	9.0	V
Collector to Emitter Voltage	V_{CEO}	6.0	V
Emitter to Base Voltage	V_{EBO}	2.0	V
Collector Current	I_C	300	mA
Total Power Dissipation	P_T	200 (CW)	mW
		1.2 (duty = 1/8)**Note**	W
		3.0 (duty = 1/24)**Note**	W
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	–65 to +150	°C

Note Pulse period is 10 msec or less.

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Date Published December 1995 P
Printed in Japan

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

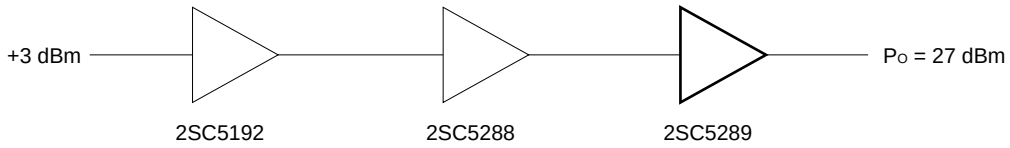
Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit
Collector Cutoff Current	I_{CBO}	V_{CB} = 5 V, I_E = 0			5	μA
Emitter Cutoff Current	I_{EBO}	V_{EB} = 1 V, I_C = 0			5	μA
DC Current Gain	h_{FE}	V_{CE} = 3.6 V, I_C = 200 mA	60			
Output Power	P_{-1}	V_{CC} = 3.6 V, f = 1.9 GHz,	26.3	27.0		dBm
Power Gain	G_P	I_{Cq} = 1 mA (class AB operation)	5.0	6.0		dB
Collector Efficiency	η_C	Duty factor 1/8	60	70		%

h_{FE} Classification

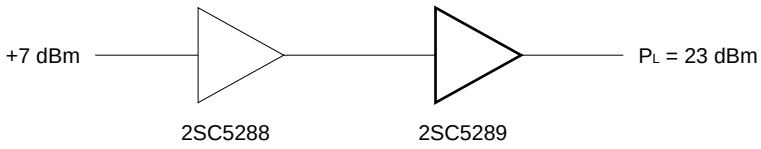
Rank	FB
Marking	T90
h_{FE}	more than 60

APPLICATION EXAMPLES

(1) Power amplifier for DECT

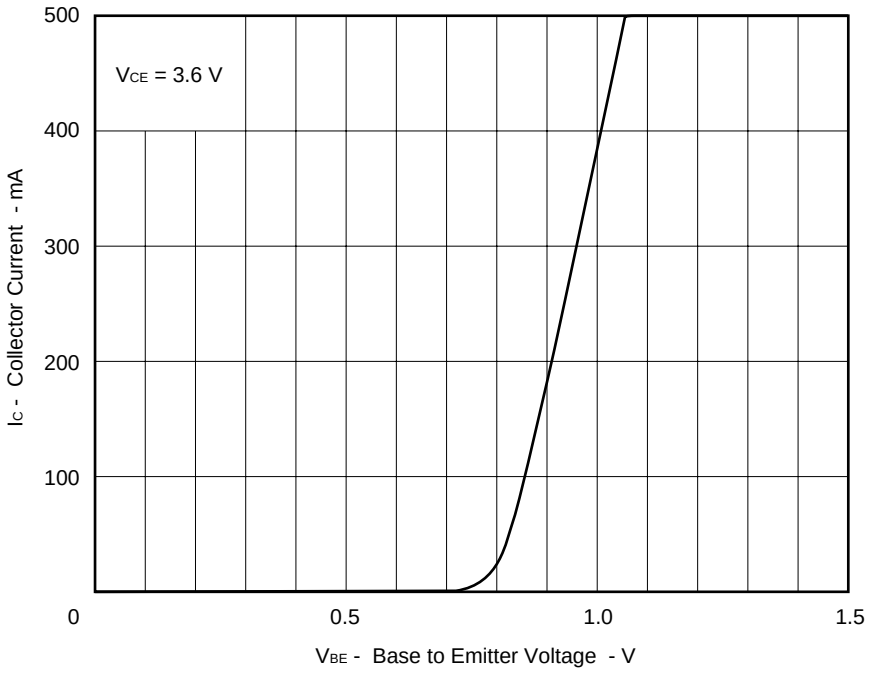


(2) Power amplifier for PHS

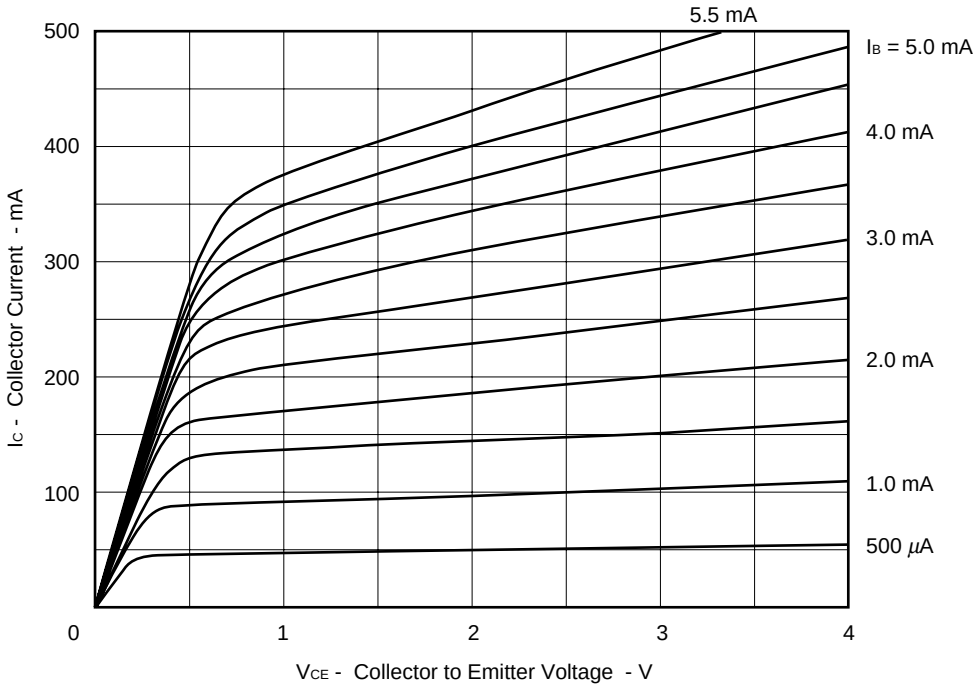


TYPICAL CHARACTERISTICS (T_A = 25 °C)

COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



S-Parameters

(V_{CE} = 3.0 V, I_C = 60 mA)

FREQUENCY	S11		S21		S12		S22	
MHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
1 500.000 000	810.84 mU	138.58	1.9411 U	48.639	106.35 mU	46.46	583.53 mU	159.88
1 600.000 000	813.96 mU	133.87	1.8066 U	45.93	110.68 mU	44.993	590.28 mU	158.28
1 700.000 000	816.5 mU	131.39	1.6922 U	43.227	116.71 mU	43.52	592.75 mU	156.45
1 800.000 000	820.32 mU	128.91	1.5947 U	40.814	121.32 mU	42.529	598.22 mU	154.73
1 900.000 000	823.53 mU	126.37	1.5047 U	38.489	126.6 mU	41.046	601.49 mU	153.51
2 000.000 000	826 mU	124.27	1.4214 U	35.858	132.01 mU	39.913	606.01 mU	151.61
2 100.000 000	832.11 mU	122.04	1.3543 U	33.591	135.99 mU	38.572	611.23 mU	150.13
2 200.000 000	832.82 mU	119.84	1.2811 U	31.268	140.46 mU	37.029	618.61 mU	148.64
2 300.000 000	835.22 mU	117.85	1.2145 U	28.982	143.87 mU	35.675	623.46 mU	147.37
2 400.000 000	839.52 mU	115.84	1.1656 U	26.992	147.44 mU	34.898	629 mU	146.29
2 500.000 000	840.38 mU	113.83	1.1211 U	25.076	152.24 mU	33.256	632.59 mU	144.88

(V_{CE} = 3.0 V, I_C = 80 mA)

FREQUENCY	S11		S21		S12		S22	
MHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
1 500.000 000	813.12 mU	136.29	1.9451 U	49.022	106.65 mU	47.457	603.6 mU	159.07
1 600.000 000	816.14 mU	133.57	1.8087 U	46.342	112.69 mU	45.889	605.91 mU	157.35
1 700.000 000	818.21 mU	131.14	1.6967 U	43.58	118.33 mU	44.529	609.17 mU	156.06
1 800.000 000	822.23 mU	128.59	1.5995 U	41.298	123.28 mU	43.227	615.78 mU	154.14
1 900.000 000	825.38 mU	126.15	1.5075 U	38.838	128.06 mU	42.023	619.82 mU	152.61
2 000.000 000	829.15 mU	124	1.4232 U	36.546	133.55 mU	40.346	623.76 mU	151.12
2 100.000 000	832.63 mU	121.76	1.3533 U	34.178	137.17 mU	39.234	630.54 mU	149.1
2 200.000 000	834.44 mU	119.51	1.2662 U	31.984	141.07 mU	37.601	634.29 mU	147.64
2 300.000 000	836.5 mU	117.57	1.2165 U	29.798	146.25 mU	36.573	636.78 mU	146.34
2 400.000 000	839.25 mU	115.54	1.1706 U	27.681	148.91 mU	35.034	644.03 mU	145.35
2 500.000 000	842.51 mU	113.57	1.127 U	25.898	153.45 mU	33.795	645.68 mU	144.07

(V_{CE} = 3.0 V, I_C = 100 mA)

FREQUENCY	S11		S21		S12		S22	
MHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
1 500.000 000	814.76 mU	136.05	1.9314 U	49.065	107.99 mU	48.52	613.88 mU	158.57
1 600.000 000	819.31 mU	133.37	1.7962 U	46.439	113.83 mU	46.594	617.68 mU	156.93
1 700.000 000	820.45 mU	130.97	1.6833 U	43.752	119.44 mU	45.216	620.63 mU	155.09
1 800.000 000	823.79 mU	128.45	1.5864 U	41.582	123.31 mU	44.018	624.8 mU	153.83
1 900.000 000	827.67 mU	125.99	1.4947 U	38.993	128.74 mU	42.175	626.73 mU	151.85
2 000.000 000	830.69 mU	123.79	1.4116 U	36.707	134.1 mU	40.887	631.19 mU	150.46
2 100.000 000	834.12 mU	121.57	1.3432 U	34.319	138.16 mU	39.995	642.25 mU	148.78
2 200.000 000	836.05 mU	119.32	1.2755 U	32.113	142.04 mU	37.886	544.41 mU	147.45
2 300.000 000	838.39 mU	117.41	1.2099 U	30.096	146.83 mU	36.992	546.33 mU	145.95
2 400.000 000	841.47 mU	115.41	1.1664 U	27.746	150.91 mU	35.305	653.15 mU	144.75
2 500.000 000	842.96 mU	113.41	1.1146 U	26.175	154.92 mU	33.58	655.82 mU	143.5

(V_{CE} = 3.0 V, I_C = 120 mA)

FREQUENCY	S11		S21		S12		S22	
MHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
1 500.000 000	817.28 mU	135.92	1.9053 U	49.017	108.15 mU	48.654	619.53 mU	158.16
1 600.000 000	820.4 mU	133.2	1.772 U	46.493	114.57 mU	46.991	621.8 mU	156.39
1 700.000 000	823.36 mU	130.75	1.6595 U	43.726	120.09 mU	45.655	626.29 mU	154.92
1 800.000 000	825.32 mU	128.24	1.5695 U	41.45	124.51 mU	44.155	630.47 mU	153.42
1 900.000 000	829.2 mU	125.81	1.4774 U	39.018	129.92 mU	42.933	635.85 mU	151.35
2 000.000 000	832.76 mU	123.66	1.394 U	36.696	135.38 mU	40.954	638.73 mU	150.05
2 100.000 000	836.5 mU	121.44	1.3251 U	34.448	139.38 mU	38.463	647.33 mU	148.43
2 200.000 000	837.77 mU	119.19	1.2596 U	32.257	143.42 mU	38.091	649.58 mU	147
2 300.000 000	839.95 mU	117.27	1.1933 U	30.067	147.59 mU	36.9	655.77 mU	145.6
2 400.000 000	843.73 mU	115.36	1.1516 U	27.979	151.38 mU	35.674	657.89 mU	144.41
2 500.000 000	845.73 mU	113.3	1.1061 U	25.164	155.57 mU	33.967	661.28 mU	143.06

(V_{CE} = 3.6 V, I_C = 60 mA)

FREQUENCY	S11		S21		S12		S22	
MHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
1 500.000 000	808.3 mU	136.65	1.9727 U	48.44	105.45 mU	46.052	581.18 mU	159.62
1 600.000 000	812.04 mU	133.93	1.8331 U	45.887	112.14 mU	44.817	583.78 mU	157.84
1 700.000 000	814.93 mU	131.51	1.717 U	43.075	116.65 mU	43.513	590.19 mU	156.29
1 800.000 000	818.28 mU	128.96	1.6198 U	40.627	121.29 mU	42.255	593.64 mU	154.41
1 900.000 000	821.86 mU	126.44	1.5247 U	38.187	126.81 mU	40.746	595.96 mU	153.05
2 000.000 000	825.72 mU	124.19	1.4443 U	35.744	131.1 mU	39.637	600.82 mU	151.54
2 100.000 000	829.72 mU	122.08	1.3633 U	33.442	135.38 mU	37.827	607.63 mU	149.72
2 200.000 000	831.5 mU	119.79	1.3006 U	31.143	139.8 mU	36.841	611.6 mU	148.28
2 300.000 000	833.66 mU	117.82	1.2319 U	28.858	143.3 mU	35.421	616.97 mU	146.8
2 400.000 000	836.78 mU	115.85	1.1841 U	26.723	148.34 mU	33.849	621.4 mU	145.82
2 500.000 000	839.53 mU	113.76	1.1409 U	24.857	152.76 mU	32.978	626.63 mU	144.7

(V_{CE} = 3.6 V, I_C = 80 mA)

FREQUENCY	S11		S21		S12		S22	
MHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
1 500.000 000	810.02 mU	136.4	1.9728 U	48.837	105.15 mU	47.085	593.74 mU	158.81
1 600.000 000	812.97 mU	133.62	1.8375 U	46.192	113.25 mU	45.405	600.04 mU	157.07
1 700.000 000	816.71 mU	131.18	1.7238 U	43.597	117.53 mU	44.256	603.01 mU	155.32
1 800.000 000	819.83 mU	128.68	1.5254 U	41.101	123.16 mU	42.965	610.67 mU	153.74
1 900.000 000	823.48 mU	126.14	1.5286 U	38.741	127.71 mU	41.206	613.44 mU	152.03
2 000.000 000	825.71 mU	123.85	1.4464 U	36.372	133.19 mU	40.31	616.32 mU	150.5
2 100.000 000	830.91 mU	121.82	1.3721 U	33.966	136.97 mU	38.649	625.55 mU	148.79
2 200.000 000	831.7 mU	119.52	1.3042 U	31.579	141.48 mU	37.348	626.62 mU	147.4
2 300.000 000	833.9 mU	117.61	1.2261 U	29.511	145.67 mU	35.89	632.27 mU	145.74
2 400.000 000	837.44 mU	115.59	1.1905 U	27.144	149.19 mU	34.415	638.49 mU	144.59
2 500.000 000	839.42 mU	113.49	1.1422 U	25.406	153.36 mU	33.499	639.69 mU	143.59

(V_{CE} = 3.6 V, I_C = 100 mA)

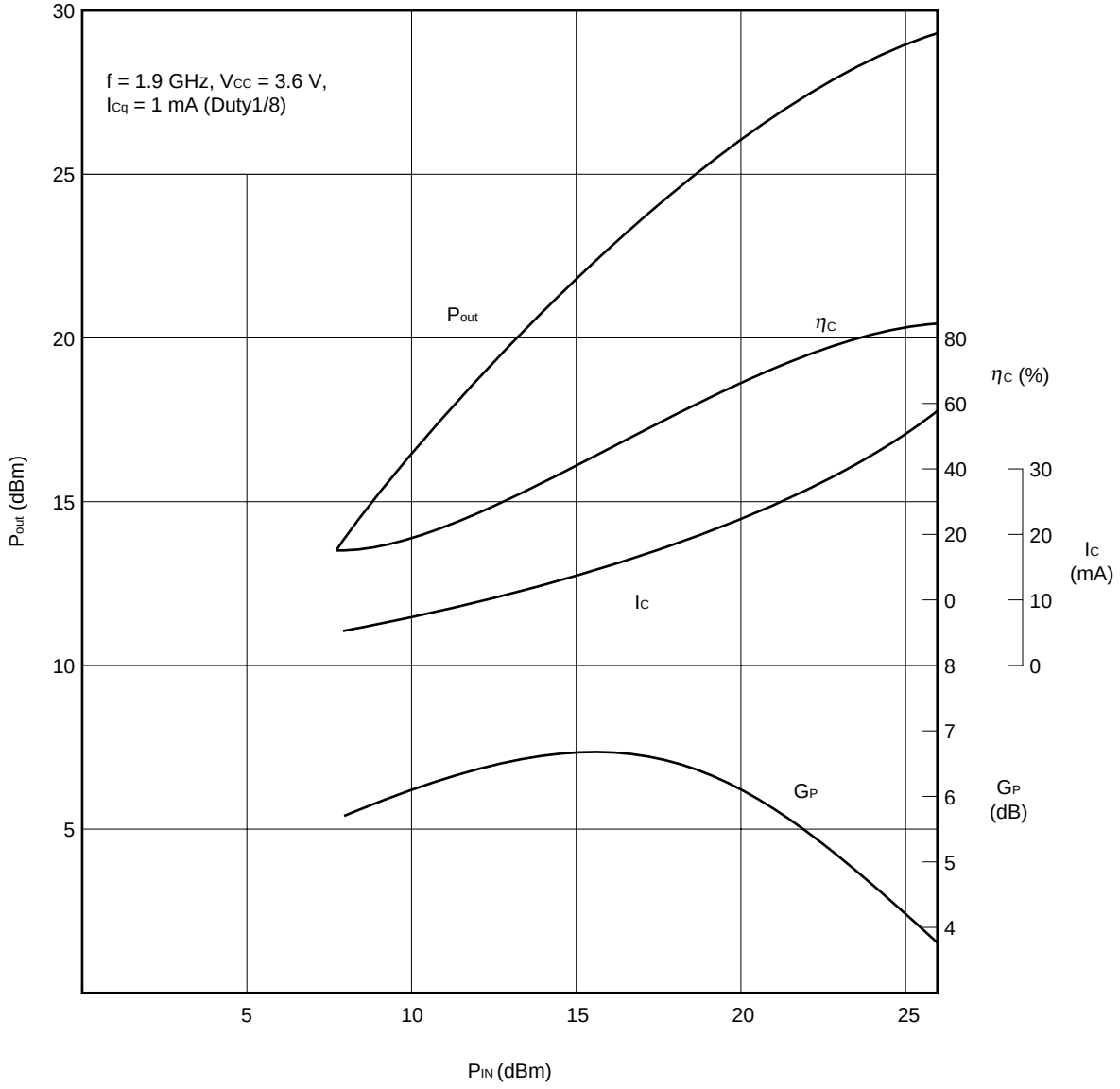
FREQUENCY	S11		S21		S12		S22	
MHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
1 500.000 000	811.66 mU	136.12	1.9697 U	49.003	107.38 mU	47.804	605.34 mU	158.29
1 600.000 000	814.26 mU	133.43	1.8813 U	46.439	113.38 mU	46.29	610.91 mU	156.55
1 700.000 000	818.45 mU	131.04	1.7121 U	43.815	119.26 mU	44.804	615.04 mU	155.21
1 800.000 000	820.54 mU	128.48	1.6163 U	41.259	123.58 mU	43.22	619.69 mU	153.57
1 900.000 000	824.22 mU	126.03	1.5227 U	38.087	129.16 mU	42.119	623.96 mU	151.68
2 000.000 000	828.13 mU	123.78	1.4383 U	36.568	133.74 mU	40.513	626.33 mU	150.24
2 100.000 000	831.24 mU	121.67	1.3657 U	34.401	137.58 mU	39.212	635.21 mU	148.57
2 200.000 000	833.15 mU	119.38	1.2999 U	32.191	142.12 mU	37.807	635.78 mU	147.17
2 300.000 000	835.39 mU	117.42	1.232 U	29.872	146.24 mU	36.259	640.55 mU	145.67
2 400.000 000	838.01 mU	115.39	1.1855 U	27.857	150.55 mU	34.921	644.12 mU	144.38
2 500.000 000	841.32 mU	113.33	1.1384 U	25.845	154.24 mU	33.691	651.67 mU	143.26

(V_{CE} = 3.6 V, I_C = 120 mA)

FREQUENCY	S11		S21		S12		S22	
MHz	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.
1 500.000 000	813.57 mU	135.96	1.9455 U	48.984	108.18 mU	48.385	614.69 mU	158.01
1 600.000 000	816.62 mU	133.29	1.8105 U	46.497	113.89 mU	47.178	616.3 mU	156.31
1 700.000 000	818.87 mU	130.77	1.6937 U	43.778	119.24 mU	45.229	620.14 mU	154.6
1 800.000 000	822.29 mU	128.31	1.5976 U	41.362	124.45 mU	44.199	624.25 mU	153.27
1 900.000 000	826.68 mU	125.87	1.5032 U	39.125	128.74 mU	42.33	628.44 mU	151.55
2 000.000 000	829.06 mU	123.66	1.4259 U	36.705	134.73 mU	41.256	629.25 mU	150.25
2 100.000 000	833.73 mU	121.53	1.3524 U	34.544	138.42 mU	39.367	639.79 mU	148.21
2 200.000 000	834.92 mU	119.23	1.2885 U	32.201	142.75 mU	38.267	642.22 mU	146.78
2 300.000 000	836.52 mU	117.34	1.2192 U	29.821	147.57 mU	36.681	645.15 mU	145.54
2 400.000 000	840.11 mU	115.29	1.1746 U	27.779	150.95 mU	35.369	652.07 mU	144.33
2 500.000 000	841.88 mU	113.25	1.1257 U	25.995	155.15 mU	34.088	653.43 mU	143.03

CHARACTERISTICS CURVES

OUTPUT POWER / COLLECTOR EFFICIENCY / COLLECTOR CURRENT / POWER GAIN VS. INPUT POWER

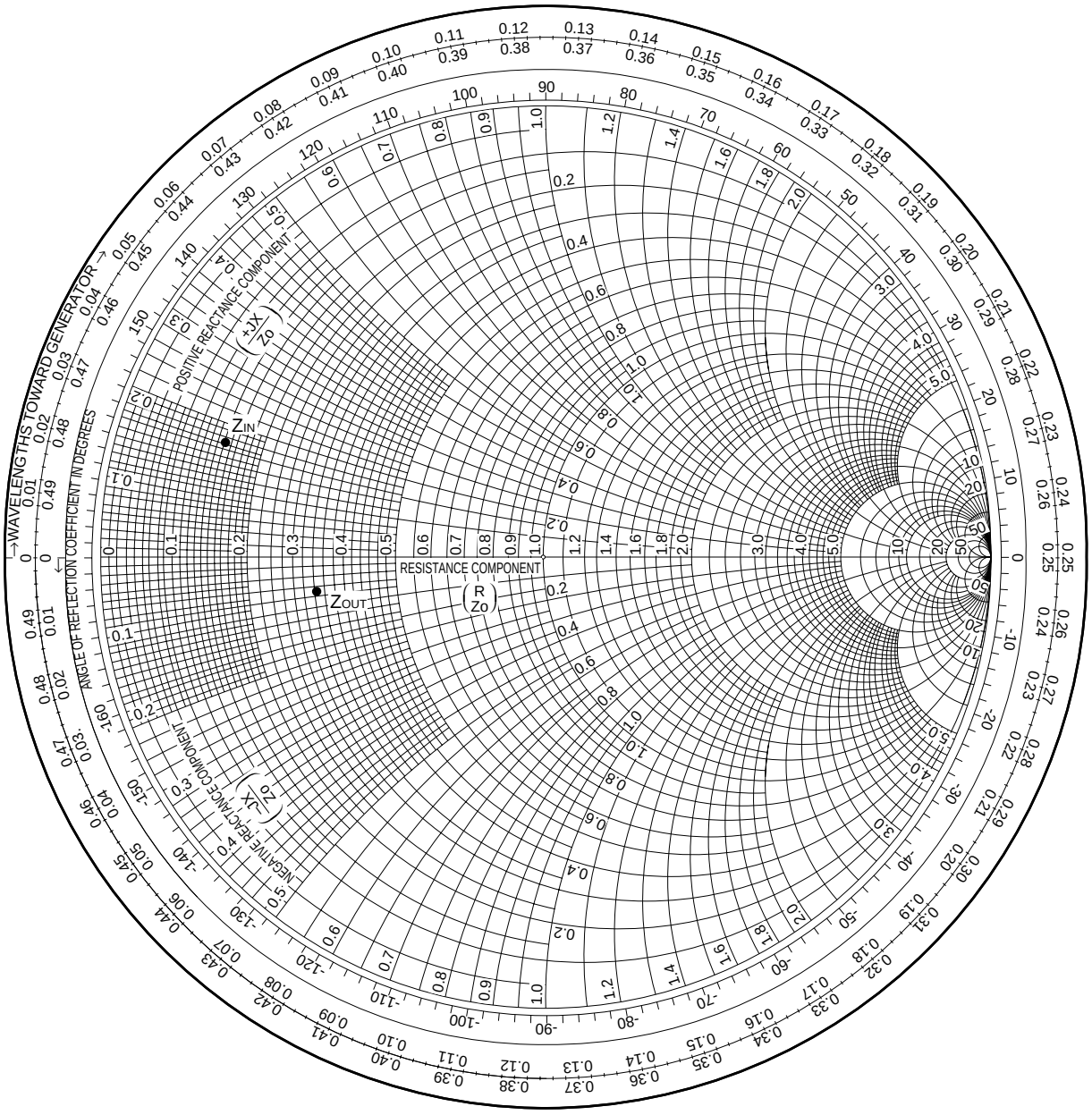


(Reference) Data from the above graph

P_{-1}	27.5	dBm
η_C (at P_{-1})	72	%
I_C (at P_{-1})	27	mA
G_L	6.7	dB

Note I_{Cq} is stand for the collector current when input power off.
Above the I_{Cq} and I_C are showing current value at 1/8 duty operation.
In case of CW (continuous wave) operation, the current value becomes eight times.
Actual bias condition; V_{CE} = 3.6 V, I_{Cq} = 8 mA @ Pin = OFF.

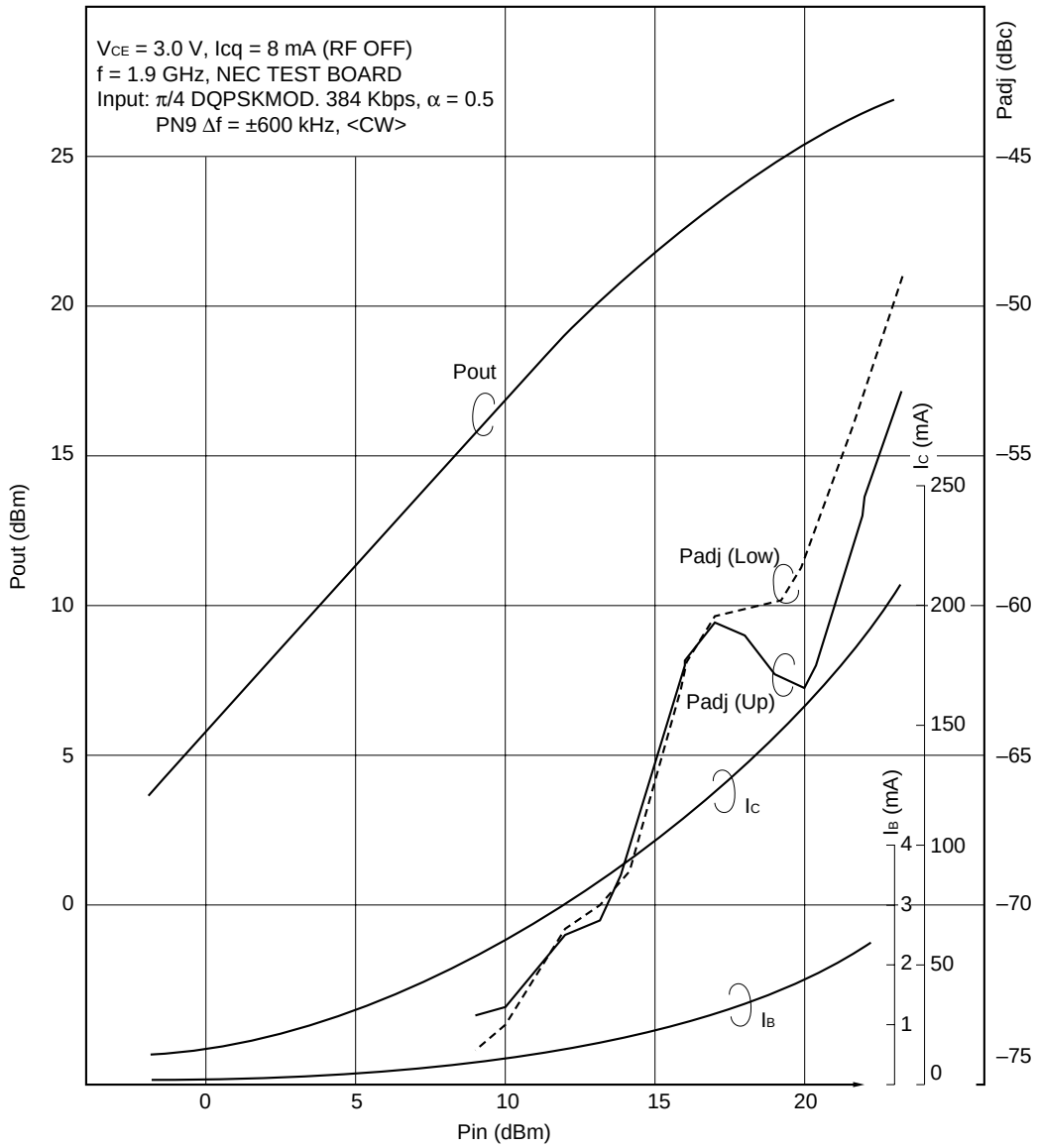
Z_{IN} (Ω), Z_{OUT} (Ω) Data



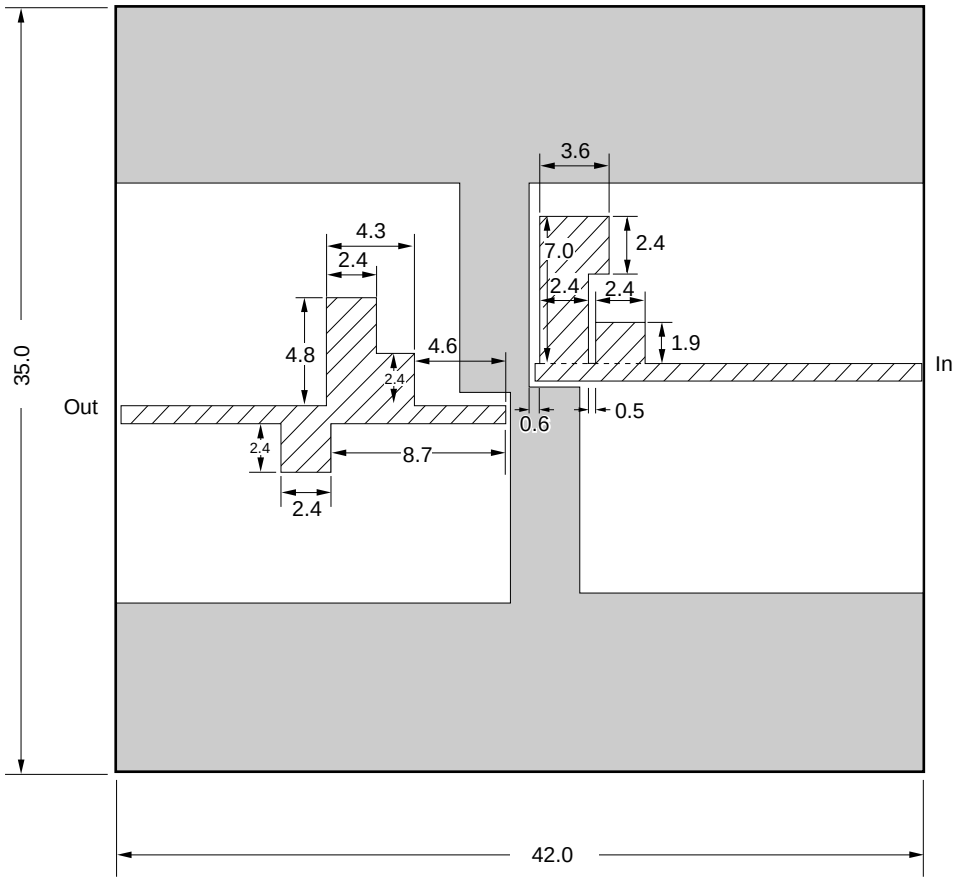
V_{CC} = 3.6 V, I_{Cq} = 1 mA, duty = 1/8

f (GHz)	Z_{in} (Ω)	Z_{out} (Ω)
1.9	7.05 + j8.52	16.0 – j3.69

(REFERENCE PERFORMANCE)



TEST BOARD Unit (mm)



t = 0.4 mm, polyimide substrate

[MEMO]

The application circuit and circuit constants shown in this document are for reference only and may not be employed for mass production of the application system.

M4 94.11

DATA SHEET

NEC

MOS FIELD EFFECT TRANSISTOR

3SK255

RF AMPLIFIER FOR UHF TUNER
N-CHANNEL Si DUAL GATE MOS FIELD-EFFECT TRANSISTOR
4 PINS SUPER MINI MOLD

FEATURES

- Low V_{DD} Use : (V_{DS} = 3.5 V)
- Driving Battery
- Low Noise Figure : NF = 1.8 dB TYP. (f = 900 MHz)
- High Power Gain : G_{PS} = 18.0 dB TYP. (f = 900 MHz)
- Suitable for uses as RF amplifier in UHF TV tuner.
- Automatically Mounting : Embossed Type Taping
- Small Package : 4 Pins Super Mini Mold

ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)

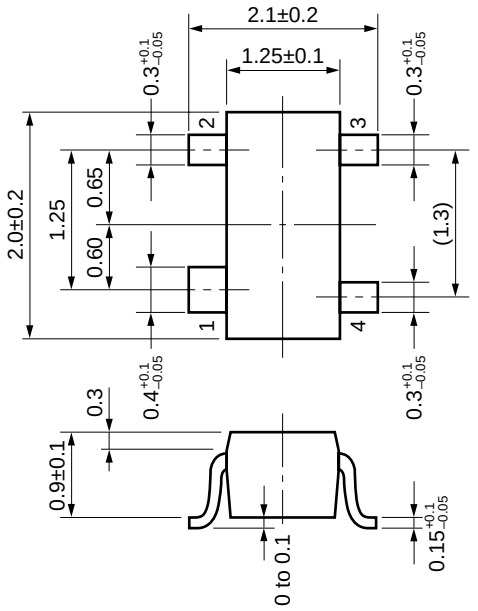
Drain to Source Voltage	V_{DSX}	18	V
Gate1 to Source Voltage	V_{G1S}	±8 ***1**	V
Gate2 to Source Voltage	V_{G2S}	±8 ***1**	V
Gate1 to Drain Voltage	V_{G1D}	18	V
Gate2 to Drain Voltage	V_{G2D}	18	V
Drain Current	I_D	25	mA
Total Power Dissipation	P_D	130	mW
Channel Temperature	T_{ch}	125	°C
Storage Temperature	T_{stg}	–55 to +125	°C

***1:** $R_L \geq 10\ k\Omega$

***2:** Free air

PACKAGE DIMENSIONS

(Unit: mm)



PIN CONNECTIONS

1. Source
2. Drain
3. Gate2
4. Gate1

PRECAUTION

Avoid high static voltages or electric fields so that this device would not suffer from any damage due to those voltage or fields.

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ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

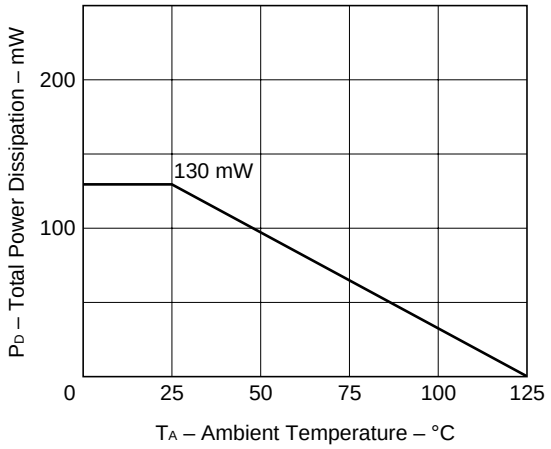
CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT	TEST CONDITIONS
Drain to Source Breakdown Voltage	BV_{DSX}	18			V	V_{G1S} = V_{G2S} = –2 V, I_D = 10 μA
Drain Current	I_{DSX}	0.5		7.0	mA	V_{DS} = 3.5 V, V_{G2S} = 3 V, V_{G1S} = 0.75 V
Gate1 to Source Cutoff Voltage	$V_{G1S(off)}$	–1.0	0	+1.0	V	V_{DS} = 3.5 V, V_{G2S} = 3 V, I_D = 10 μA
Gate2 to Source Cutoff Voltage	$V_{G2S(off)}$	0	0.5	1.0	V	V_{DS} = 3.5 V, V_{G1S} = 3 V, I_D = 10 μA
Gate1 Reverse Current	I_{G1SS}			±20	nA	V_{DS} = 0, V_{G2S} = 0, V_{G1S} = ±6 V
Gate2 Reverse Current	I_{G2SS}			±20	nA	V_{DS} = 0, V_{G1S} = 0, V_{G2S} = ±6 V
Forward Transfer Admittance	$\|y_{fs}\|$	14	19	24	mS	V_{DS} = 3.5 V, V_{G2S} = 3 V, I_D = 7 mA f = 1 kHz
Input Capacitance	C_{iss}	1.2	1.7	2.2	pF	V_{DS} = 3.5 V, V_{G2S} = 3 V, I_D = 7 mA f = 1 MHz
Output Capacitance	C_{oss}	0.5	1.0	1.5	pF	
Reverse Transfer Capacitance	C_{rss}		0.01	0.03	pF	
Power Gain	G_{ps}	15	18	21	dB	V_{DS} = 3.5 V, V_{G2S} = 3 V, I_D = 7 mA f = 900 MHz
Noise Figure	NF		1.8	3.0	dB	

I_{DSX} Classification

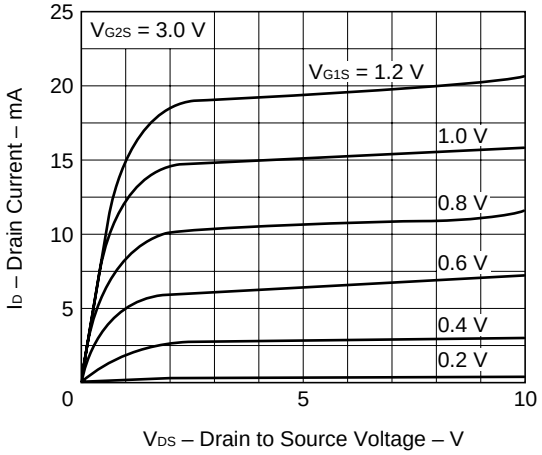
Rank	U1G
Marking	U1G
I_{DSX} (mA)	0.5 to 7.0

TYPICAL CHARACTERISTICS (T_A = 25 °C)

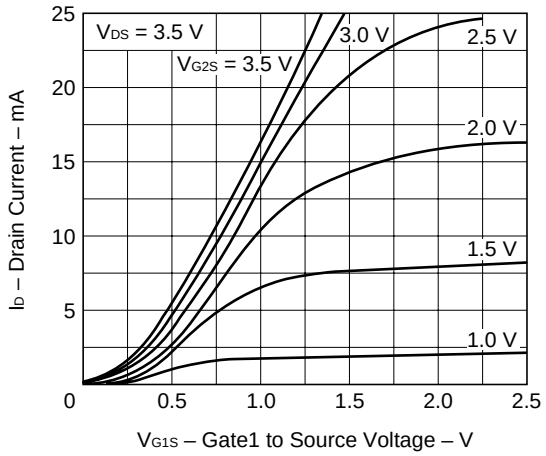
TOTAL POWER DISSIPATION vs.
AMBIENT TEMPERATURE



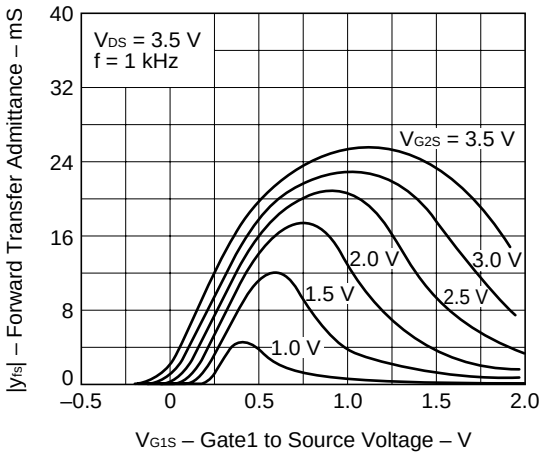
DRAIN CURRENT vs.
DRAIN TO SOURCE VOLTAGE



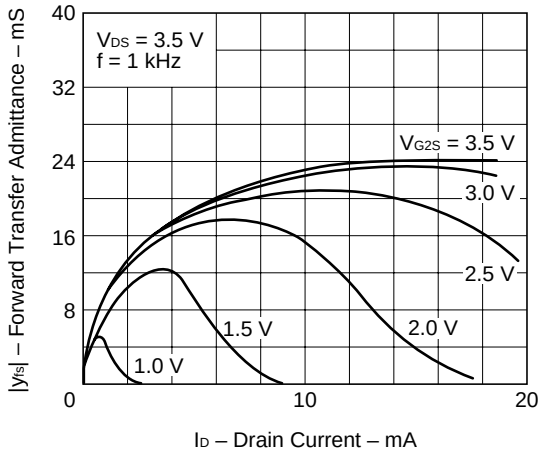
DRAIN CURRENT vs.
GATE1 TO SOURCE VOLTAGE



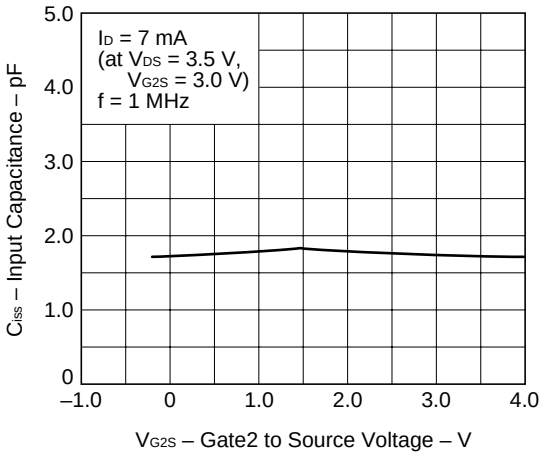
FORWARD TRANSFER ADMITTANCE vs.
GATE1 TO SOURCE VOLTAGE



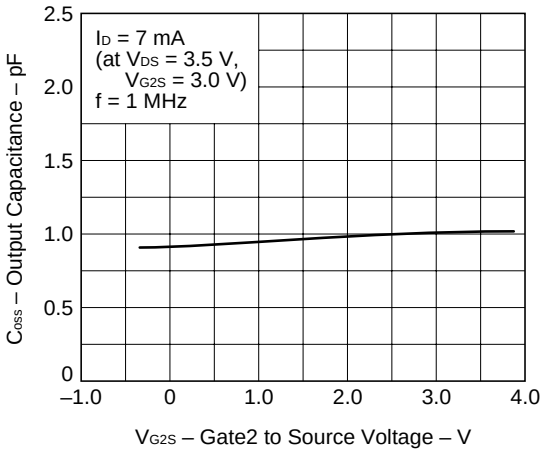
FORWARD TRANSFER ADMITTANCE vs.
DRAIN CURRENT



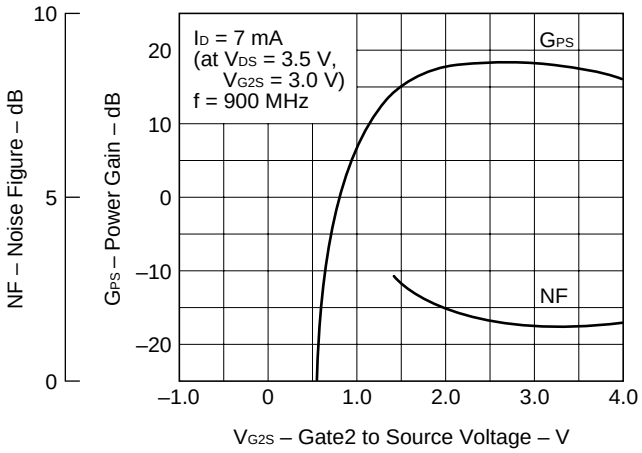
INPUT CAPACITANCE vs.
GATE2 TO SOURCE VOLTAGE



OUTPUT CAPACITANCE vs.
GATE2 TO SOURCE VOLTAGE



POWER GAIN AND NOISE FIGURE vs.
GATE2 TO SOURCE VOLTAGE

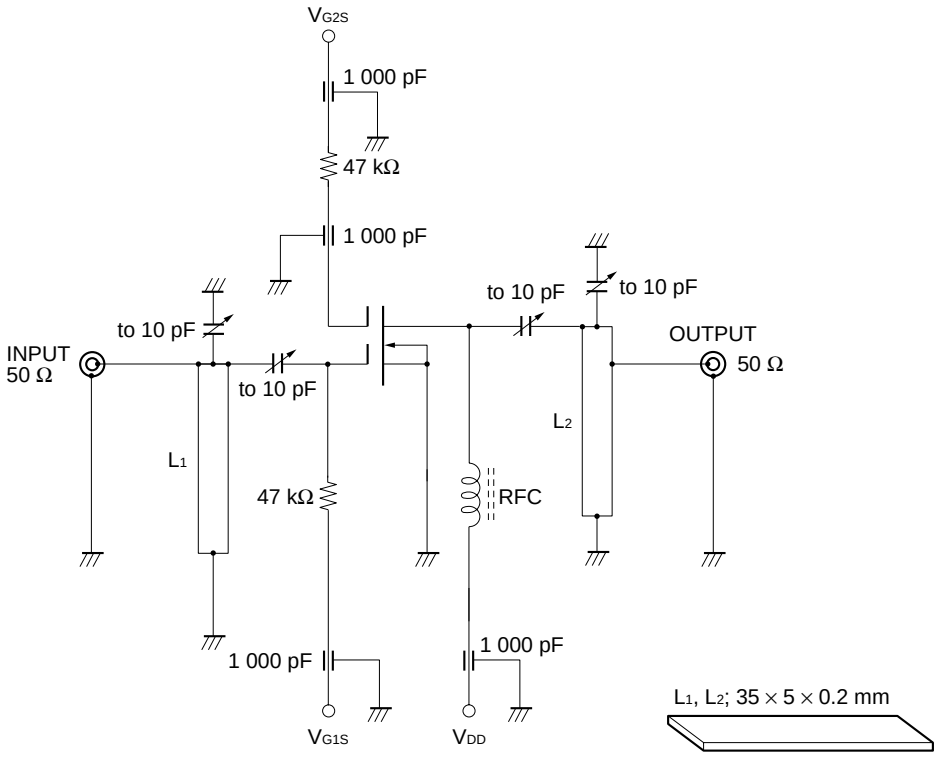


S-Parameter

V_{DS} = 3.5 V, V_{G2S} = 3 V, I_D = 7 mA

Frequency	S11		S21		S12		S22	
(MHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	1.017	–6.5	2.057	173.3	0.035	–88.2	0.985	–2.9
200	1.000	–13.4	2.034	163.6	0.014	–121.6	0.987	–6.9
300	0.999	–19.8	1.991	155.5	0.006	67.0	0.988	–10.4
400	0.993	–26.6	1.996	146.8	0.006	71.3	0.983	–13.8
500	0.984	–32.6	1.956	136.7	0.005	117.8	0.985	–17.1
600	0.966	–39.1	1.930	130.4	0.002	–23.3	0.983	–20.8
700	0.948	–45.5	1.901	122.7	0.002	–162.4	0.979	–24.6
800	0.934	–51.4	1.897	114.5	0.003	37.8	0.986	–27.9
900	0.908	–57.5	1.897	105.6	0.011	–146.3	0.991	–32.1
1000	0.901	–83.8	1.984	96.6	0.010	–144.3	1.024	–36.4

G_{PS} AND NF TEST CIRCUIT AT f = 900 MHz



[MEMO]

[MEMO]

Advantages

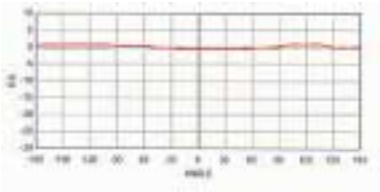
- Broadband Performance
- Low Profile, Economical Design
- Designed for Indoor & Outdoor Use
- Rugged UV ABS Stable Radome
- Easy to Mount

Specifications

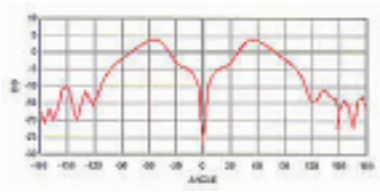
Electrical

Frequency	*824-896, 890-940 **806-866
Element Type	Edge Slot Radiator
Polarization	Vertical
Gain (min)	+3 dBi
Azimuth	Omnidirectional
Elevation	Cosine Shaped Monopole
VSWR	<1.5:1 @ resonance 2:1
Impedance	50 Ohm
Power	100 Watts
Cable Type	RG-58U

Azimuth Pattern



Elevation Pattern



Mechanical

Connector	Several Types Available
Mounting	Base Mounting Plate, Adhesive Backed
Wind Survival	150 MPH
Temperature	-40– to 160–F
Dimensions	3.0" Dia. Top, 4.5" Dia. Base, 0.62" Height
Weight	<1 lbs

**Please note: Model No. PCNLP-08V is for the 824 to 896 MHz frequency range, Model No. PCNLP-09V is for the 890 TO 940 MHz frequenzcy range and Model No. PCNLP-08V1 is for the 806 to 866 MHz Frequency Range*

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ASTRON specializes in designing and manufacturing custom antennas. If this particular antenna does not meet with your requirements, Astron can provide you with other antenna solutions optimized to your specific application. This antenna is available in various frequencies.

Astron Antenna Co.
22560 Glenn Drive, Suite 114
Sterling, Virginia 20164-4440

703.450.5517
Fax:703.450.9753
Commercial Sales

SPECIFICATIONS

NAME OF PRODUCT : MCX Right Angle Jack Connector for PCB

P/N: 29K203-400D3

NAME OF MAKER : Rosenberger Hochfrequenztechnik GmbH and Co.

RECEIPT COLUMN

COMPANY NAME OF DELIVERY

FUSOH SHOJI CO.,LTD.

RECOGNITION : SALES AND MARKETING DIVISION II
TOSHIO SUZAKI
T. Suzaki

CHARGE : SALES AND MARKETING DIVISION II
SHUZO OMIYA
S. Omiya
MARCH. 6th. '2000

1. Name of Product
   MCX Right Angle Jack for PCB Connector
   P/N: 29K203-400D3

2. Name of manufacturer
   Rosenberger Hochfrequenztechnik GmbH and Co.

3. Name of Trading company
   Fusoh Shoji Co.,Ltd.

4. Change of specifications or Production Discontinuation
   In case that production should be discontinued or these specifications should be amended, manufacture must advise immediately, and have a meeting to solve the problem.

5. Warranty Period
   1 year from shipping date.

6. Outline Dimensions, Electric Performance (Please refer to below.)
   Outline Dimensions—6/6 page, Electric Performance—4/6 page, Installation Dimensions on PCB—5/6 page, Connector standard—3/6 page

7. Required documents at the time of delivery
   Certificate of Conformance one copy

Series MCX 50 Ω

Compact microminiature coaxial connector with high reliability and long service life for frequencies up to 6 GHz for 50 Ω version.

MCX connectors have a snap-on connecting system. In comparison to the related SMB connector (identical design of center conductor and insulator support), whose reliability has been retained, the optimized arrangement of the outer conductor and the locking device requires approximately 30 % less mounting space.

Straight and angled connector types are available for flexible and semi-rigid cable with diameters from 1.2 mm to 3.1 mm, as well as models for panel and PCB applications with various mounting technologies.

Design in accordance with: CECC 22 220

Quality tested in accordance with: US MIL-Std 202

Cable mounting: crimp, solder-crimp and solder versions

Special versions: components for PCB applications (solder, press-fit, SMT, SMCC), cable clamps

Serie MCX 50 Ω

Kompakter Mikrominiatur-Koaxialsteckverbinder hoher Zuverlässigkeit, großer Lebensdauer und einfacher Montierbarkeit für Einsatzfälle bis 6 GHz in der 50 Ω - Ausführung.

Der Steckverbinder ist mit einer Schnappverbindung ausgestattet. Gegenüber dem nahe verwandten SMB-Steckverbinder (gleiche Gestaltung von Innenleiter und Isolierstütze), dessen Zuverlässigkeit beibehalten wird, ergibt sich durch günstige Gestaltung des Außenleiters und des Rastmechanismus eine Verringerung des Bauraumes von ca. 30%.

Es existieren Bauformen in gerader und abgewinkelter Ausführung für flexible und halbstarre Kabel mit Durchmessern von ca. 1,2 mm bis 3,1 mm, für Gehäuseeinbau und für Leiterplatteneinsatz mit verschiedenen Anschlußtechniken.

Anschlußdimensionen nach: *CECC 22 220*

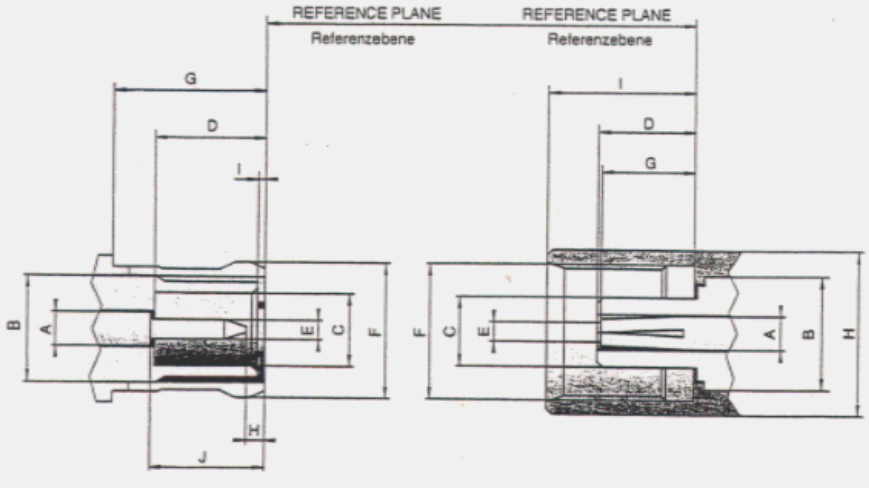
Qualitätsprüfung nach: *US MIL-STD 202*

Kabelmontage: *Crimp-, Löt-Crimp- oder Lötverbindung*

Spezialausführungen: *Elemente für Leiterplatten (Löt-, SMT, SMCC und Einpreßtechnik), Kabelabfangungen,*

Mechanical Characteristics

Anschlußmaße



MALE
STECKER

FEMALE
KUPPLER

MCX (50 Ohm) Serie 29					
	MALE STECKER		FEMALE KUPPLER		
	min.	max.	min.	max.	
A	0.95 nom 1)		0.95 nom 1) 2)		A
B		3.00 1)			B
C	2.00	2.07	1.85	1.95	C
D	2.80		2.60	2.80	D
E	0.48	0.53	0.55	0.58	E
F		3.80 3)	3.60	3.75	
G	4.15		2.30	2.80	G
H	0.15				H
I	0.00	0.30	4.00	4.12	I
J	2.80	3.20			

1) Contact diameters refer to 50 Ohm
Durchmesser Innenleiter / Außenleiter müssen 50 Ohm entsprechen

2) resilient, dim. to meet electrical and mechanical requirements
federnd zusammengezogen (Erfüllung elektr./mech. Forderungen)

3) when slotted
nach dem Schlitzen

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Technical Characteristics MCX 50 Ω

Technische Daten MCX 50 Ω

Electrical characteristics		***Elektrische Daten***
Characteristic impedance	50 Ω	Wellenwiderstand
Frequency range	0...6 GHz	Frequenzbereich
VSWR (straight contacts)	≤ 1.20 typ.	VSWR (gerader Kontakt)
Insertion loss (dB)	0.1 dB max. /1GHz typ.	Dämpfung (dB)
Insulation resistance	1000 MΩ	Isolationswiderstand
Center contact resistance	≤ 5.0 mΩ	Übergangswiderstand Innenleiter
Outer contact resistance	≤ 2.5 mΩ	Übergangswiderstand Außenleiter
Test voltage	750 V rms	Prüfspannung
Working voltage	335 V rms	Betriebsspannung
Contact current	typ. 1.5 A DC max.	Strombelastbarkeit
Mechanical characteristics		***Mechanische Daten***
Engagement force	≤ 15N max.	Einsteckkraft
Disengagement force	$8N \leq F_a \leq 20$ N	Ausziehkraft
Center contact retention force	≥ 10N	Innenleiter Haltekraft
Connecting operations	≥ 500	Anzahl Steckzyklen
Enviromental		***Umgebungseinflüsse***
Temperature range	-65°C - +155°C	Temperaturbereich
Vibration	MIL-STD-202 Meth. 204/B	Vibration
Humidity	MIL-STD-202 Meth. 106/D	Feuchtigkeit
Shock	MIL-STD-202 Meth. 213/B	Schock
Temperature cycle	MIL-STD-202 Meth. 102/C	Temperatur Zyklen
Materials		***Materialien***
Body	Brass	Außenleiter
Spring loaded contacts parts	CuBe	federnde Kontaktteile
Insulator	PTFE	Isolator
Crimping sleeve	Soft Copper	Krimphülse
Gaskets	Rubber	Dichtungen
Plating body contact area	Center contact is 1.27 μ min thickness of gold plated.	
Plating center contact area	Body contact is 1.27 μ min thickness of gold plated.	

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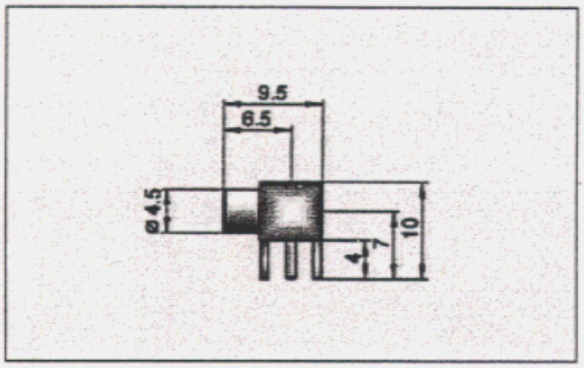
ROSENBERGER

Part Specification

part number: 29 K 203-400 D3

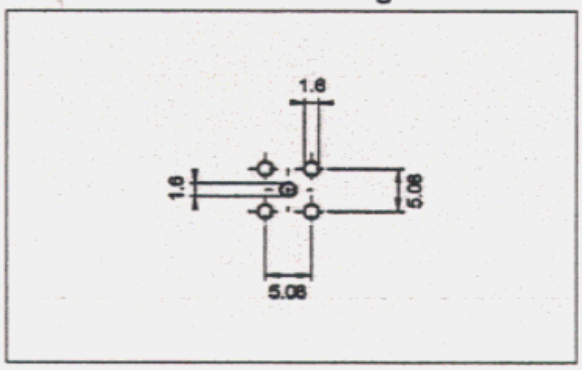
Connectors, MCX
Right Angle Jack for PCB

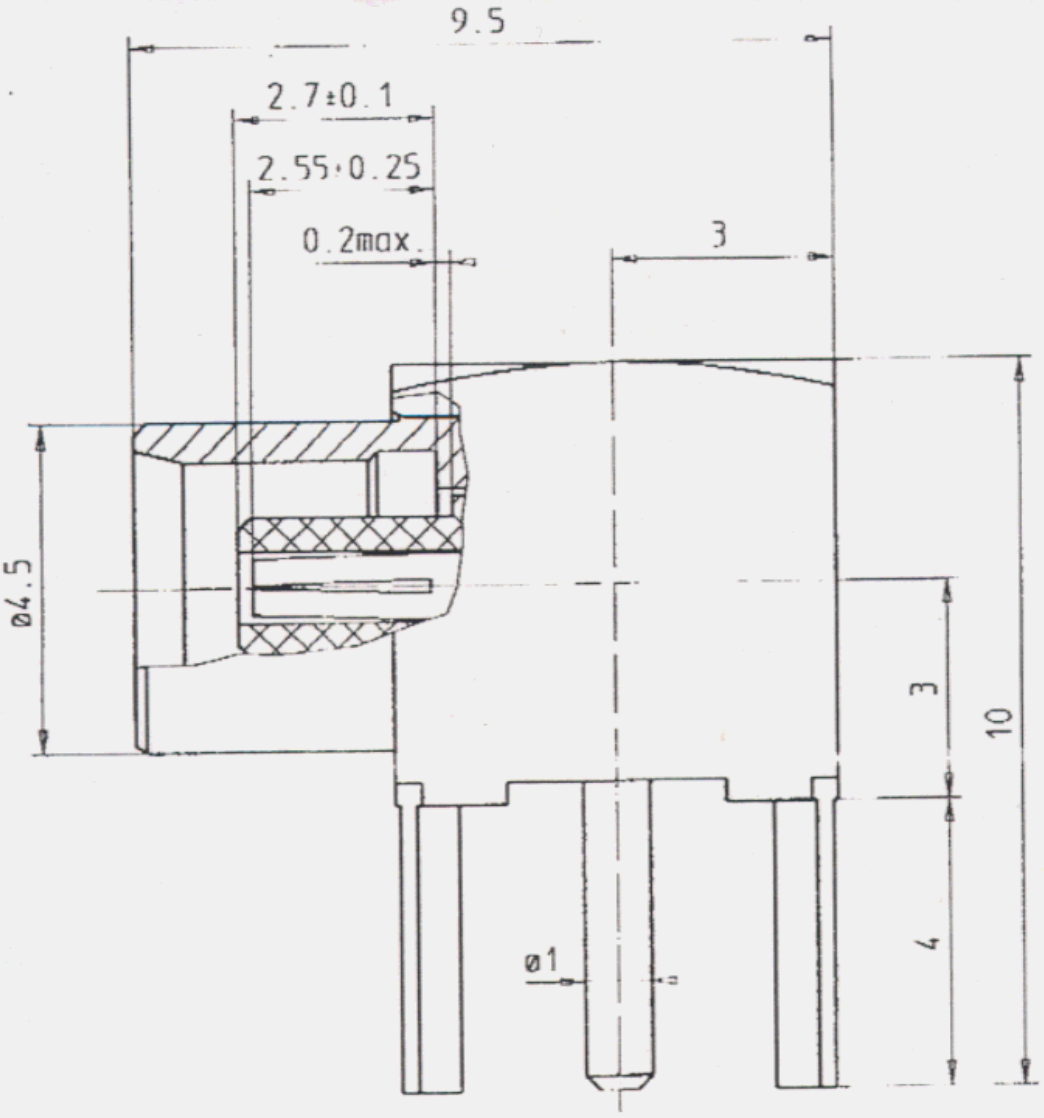


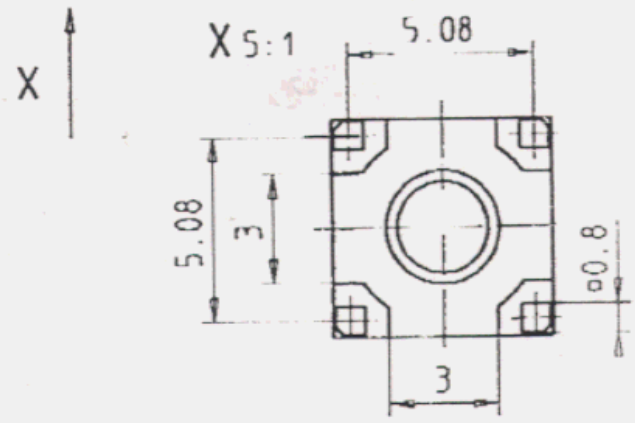
Technical Characteristics

Panel Piercing: B 30

Panel Piercing







Rosenberger Hochfrequenztechnik 84526 Tittmoning CAD			Montagel B 30	Maßstab 10:1 (1:1)	
				Serie MCX CECC 22 220	
		Datum	Name	Benennung	
		Bearb 18 10 1995	A. König	Winkelkuppler	
		Gepr 19.11.95			
		Norm			
		Oberfl			Blatt-Nr.
		D3		29 K 203-400	Bl.
a	95-0406	18 10 1995	König		
Zust.	Aenderung	Datum	Name		

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MURATA MANUFACTURING CO., LTD.

NEMQ03-2296A

VCO SPECIFICATION (PRELIMINARY)

1. PART NUMBER MQE918-836

2-1.CONDITIONS

The specifications shall be valid under the following conditions:

Quantity	Symbol	Limits			Units
		min.	typ.	max.	
Supply Voltage	VB	2.4	2.7	3.0	V
Control voltage range	VC	+0.0	-	+3.0	V
Load impedance		-	50	-	ohm

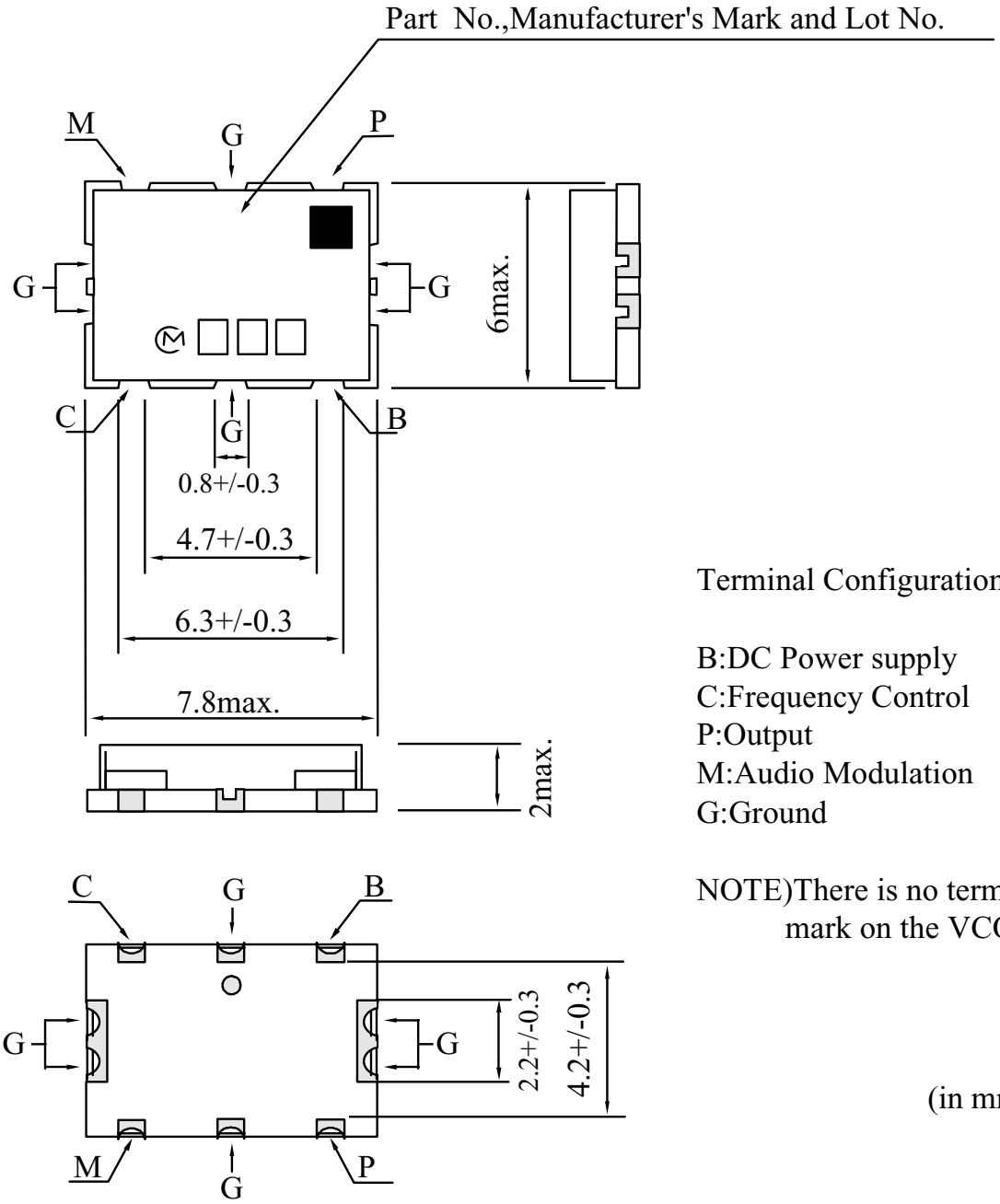
Conditions unless otherwise noted: V_B=2.7+/-0.02V, Temperture 25 deg C, Load 50 ohm.

2-2.ELECTRICAL CHARACTERISTICS

Quantity	Condition	Limits			Unit
		min.	typ.	max.	
Power consumption		-	-	8	mA
Operating Frequency Range		824.5	-	849.5	MHz
Control Voltage sensitivity	Vc=0.5~2.5V Ave.	17	21	25	MHz/V
Output level		-4	-	-	dBm
C/N	60kHz sep., 30kHz B.W.	-	-	-67	dBc
S/N	S leve:fm=1kHz, Dev.=+/-3kHz., B.W.=0.3~3.0kHz	-	-	-45	dB
Audio Modulation Sensitivity	fm=1kHz, Dev.=+/-12kHz	283	353	423	Vrms
Audio Modulation Sensitivity Deviation	836.5+/-13.0MHz	-10	-	10	%
Pushing figure	V_B=2.7+/-0.3V, ref:V_B=2.7V	-1	-	1	MHz
Pulling figure	VSWR2.0 for all phase, ref:50ohm	-1	-	1	MHz
Temperature stability	at –30~+85 degC, ref 25deg C	-3	-	3	MHz
Spurious Response		-	-	-10	dBc

3.DIMENSIONS:9-11

3.DIMENSIONS:9-11 TYPE



Terminal Configuration

B:DC Power supply
C:Frequency Control
P:Output
M:Audio Modulation
G:Ground

NOTE)There is no terminal mark on the VCO.

(in mm)

MURATA MANUFACTURING CO., LTD.

NEMQ03-2361

VCO SPECIFICATION

1. PART NUMBER MQH004-967

2-1.CONDITIONS

The specifications shall be valid under the following conditions:

Quantity	Symbol	Limits			Units
		min.	typ.	max.	
Supply Voltage	VB	2.6	2.7	2.8	V
Control voltage range	VC	+0.5	-	+2.2	V
Load impedance		-	50	-	ohm

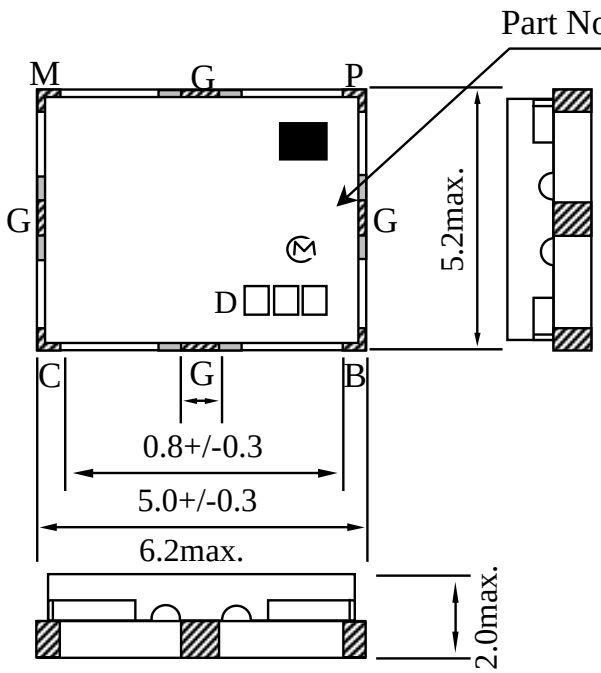
Conditions unless otherwise noted: V_B=2.7+/-0.02V, Temperture+25 degC, Load 50 ohm.

2-2.ELECTRICAL CHARACTERISTICS

Quantity	Condition	Limits			Unit
		min.	typ.	max.	
Power consumption		-	-	7.5	mA
Operating Frequency Range		954	-	980	MHz
Control Voltage sensitivity	Vc=0.5~2.3V Ave.	22	26	30	MHz/V
Output level		-5	-2	+1	dBm
C/N	25kHz sep., 16kHz B.W.	67	-	-	dBc
Pushing figure	V_B=2.7+/-0.1V, ref:V_B=2.7V	-500	-	+500	kHz
Pulling figure	VSWR2.0 for all phase, ref:50ohm	-500	-	+500	MHz
Temperature stability	at –30~+85 degC, ref 25deg C	-4		+4	MHz
Spurious Response		-	-	-10	dBc

3.DIMENSIONS:H3-1

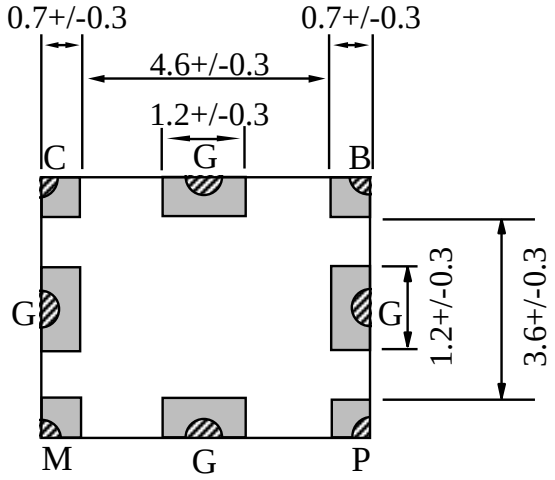
3.DIMENSIONS:H3-1 TYPE



Terminal Configuration

B:DC Power supply
C:Frequency Control
P:Output
M:No Contact
G:Ground

NOTE)There is no terminal mark on the VCO.



Terminals
□ : Gold plating
▨ : Solder

(in mm)