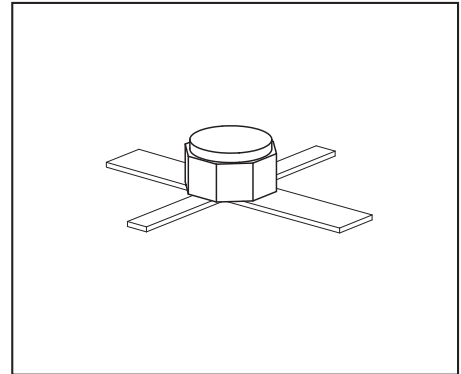


**HiRel K-Band GaAs Super Low Noise HEMT**

- **HiRel Discrete and Microwave Semiconductor**
  - Pseudo- morphic AlGaAs/InGaAs/ GaAs HEMT
  - For professional super low-noise amplifiers
  - For frequenzcies from 500 MHz to >20 Ghz
  - Hermetically sealed micorowave package
  - Super low noise figure, high associated gain
  - **esa Space Qualified**
- ESA/SCC Detail Spec. No.: 5613/004  
 Type Variante No.s 01 to 04, 05 foressen (tbc.)



Type	Marking	Pin Configuration				Package
CFY67-06	-	1=G	2=S	3=D	4=S	MICRO-X
CFY67-08	-	1=G	2=S	3=D	4=S	MICRO-X
CFY67-08P	-	1=G	2=S	3=D	4=S	MICRO-X
CFY67-10	-	1=G	2=S	3=D	4=S	MICRO-X
CFY67-10P	-	1=G	2=S	3=D	4=S	MICRO-X

(ql) Testing level: P: Professional testing  
 H: High Rel quality  
 S: Space quality  
 ES: ESA qualified

CFY67-nnl: specifies gain and output power levels (see electrical characterisitcs)

**Maximum Ratings**

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	3.5	V
Drain-gate voltage	$V_{DG}$	4.5	
Gate-source voltage (reverse/ forward)	$V_{GS}$	-3...0.5	
Drain current	$I_D$	60	mA
Gate forward current	$I_G$	2	
RF input power, C- and X-band <sup>1)</sup>	$P_{RF,in}$	10	dBm
Junction temperature	$T_j$	150	°C
Storage temperature	$T_{stg}$	-65...150	
Total power dissipation <sup>2)</sup>	$P_{tot}$	200	mW
Soldering temperature <sup>3)</sup>	$T_{sol}$	230	°C

**Thermal Resistance**

Parameter	Symbol	Value	Unit
Junction - soldering point	$R_{thJS}$	≤ 515 (tbc)	K/W

**Electrical Characteristics (at  $T_A = 25$  °C; unless otherwise specified)**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	

**DC Characteristics**

Drain- source saturation current $V_{DS} = 2$ V, $V_{GS} = 0$ V	$I_{DSS}$	15	30	60	mA
Gate threshold voltage $V_{DS} = 2$ V, $I_D = 1$ mA	$-V_{Gth}$	0.2	0.7	2	
Drain current pinch-off $V_{DS} = 1.5$ V, $V_{GS} = -3$ V	$I_{Dp}$	-	<50	-	μA
Gate leakage current at pinch-off $V_{DS} = 1.5$ V, $V_{GS} = -3$ V	$-I_{Gp}$	-	<50	200	
Transconductance $V_{DS} = 2$ V, $I_D = 15$ mA	$g_{m15}$	50	65	-	mS
Gate leakage current at operation $V_{DS} = 2$ V, $I_D = 15$ mA	$-I_{G15}$	-	<0,5	2	μA

<sup>1)</sup>For  $V_{DS}$  2V. For  $V_{DS}$  2 V, derating is required.

<sup>2)</sup>At  $T_S = 47$ °C. For  $T_S > 47$ °C derating is required.

<sup>3)</sup>During 15 sec. maximum. The same terminal shall not be resoldered until 3 minutes have elapsed.

**Electrical Characteristics**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
<b>AC Characteristics</b>					
Noise figure <sup>1)</sup> $V_{DS} = 2\text{ V}$ , $I_D = 15\text{ mA}$ , $f = 12\text{ GHz}$ CFY67-06 CFY67-08, -08P CFY67-10, -10P	$NF$	-	0.5	0.6	dB
		-	0.7	0.8	
		-	0.9	1	
Associated gain <sup>1)</sup> $V_{DS} = 2\text{ V}$ , $I_D = 15\text{ mA}$ , $f = 12\text{ GHz}$ CFY67-06 CFY67-08, -08P CFY67-10,- 10P	$G_a$	11.5	12.5	-	
		11	11.5	-	
		140.5	11	-	
Output power at 1 dB gain compr. <sup>2)</sup> $V_{DS} = 2\text{ V}$ , $I_D = 20\text{ mA}$ , $f = 12\text{ GHz}$ CFY67-06, -08, -10 CFY67-08P, -10P	$P_{1dB}$	-	11	-	dBm
		10	11	-	

<sup>1</sup>Noise figure/nassociated gain characterisitcs given for minimum noise figure matching conditions (fixed generic matching, no fine- tuning).

<sup>2</sup>Output power chcharacterisitcs given for optimum output matchingconditions (fixed generic matching, no fine-tuning).

**Typical Common Source S-Paramters**

 CFY67-08:  $V_{DS} = 2\text{ V}$ ,  $I_D = 15\text{ mA}$ ,  $Z_0 = 50\ \Omega$ 

f	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>		k-Fact.	S <sub>21</sub> /S <sub>12</sub>	MAG
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	MAG	dB	dB
0.5	0.963	-15	5.315	165	0.0111	74	0.655	-14	0.4	26.8	-
1	0.938	-23	5.182	159	0.0225	68	0.639	-18	0.39	23.6	-
1.5	0.913	-33	5.06	150	0.0317	62	0.625	-23	0.42	22	-
2	0.889	-42	4.94	142	0.0411	57	0.611	-28	0.43	20.8	-
2.5	0.865	-52	4.824	133	0.0509	53	0.596	-35	0.43	19.8	-
3	0.844	-62	4.715	124	0.0585	46	0.582	-41	0.45	19.1	-
3.5	0.823	-72	4.591	115	0.065	41	0.567	-47	0.47	18.5	-
4	0.8	-81	4.45	107	0.0714	36	0.552	-53	0.5	17.9	-
4.5	0.779	-91	4.319	99	0.0768	31	0.534	-60	0.52	17.5	-
5	0.761	-100	4.183	91	0.0811	25	0.52	-66	0.54	17.1	-
5.5	0.743	-109	4.043	83	0.085	20	0.5	-72	0.58	16.8	-
6	0.725	-117	3.906	75	0.0885	15	0.49	-77	0.6	16.4	-
6.5	0.708	-125	3.769	68	0.0917	11	0.477	-83	0.63	16.1	-
7	0.69	-132	3.64	61	0.0942	7	0.467	-88	0.67	15.9	-
7.5	0.673	-139	3.529	54	0.0962	3	0.455	-93	0.71	15.6	-
8	0.656	-146	3.427	48	0.0978	-1	0.442	-97	0.76	15.4	-
8.5	0.64	-153	3.344	41	0.0998	-5	0.43	-101	0.79	15.3	-
9	0.625	-160	3.271	34	0.101	-9	0.417	-104	0.84	15.1	-
9.5	0.611	-168	3.202	28	0.1027	-12	0.406	-108	0.87	14.9	-
10	0.597	-175	3.143	21	0.1033	-16	0.393	-113	0.91	14.8	-
10.5	0.586	177	3.089	15	0.1044	-20	0.381	-118	0.94	14.7	-
11	0.576	169	3.041	8	0.1056	-24	0.37	-123	0.96	14.6	-
11.5	0.564	161	3.002	1	0.1068	-28	0.358	-129	0.98	14.5	-
12	0.554	154	2.96	-5	0.107	-32	0.351	-134	1.01	14.4	13.8
12.5	0.547	146	2.923	-12	0.1076	-36	0.343	-140	1.03	14.3	13.3
13	0.536	139	2.886	-19	0.1076	-41	0.336	-146	1.06	14.3	12.7
13.5	0.529	131	2.848	-26	0.1081	-45	0.33	-151	1.09	14.2	12.4
14	0.522	124	2.815	-33	0.1087	-50	0.325	-156	1.11	14.1	12.1
14.5	0.517	116	2.787	-40	0.1087	-55	0.32	-161	1.13	14.1	11.9
15	0.51	108	2.765	-46	0.1093	-60	0.315	-167	1.14	14	11.7
15.5	0.505	99	2.751	-54	0.109	-65	0.311	-172	1.16	14	11.6

**Typical Common Source S-Parameters**

 CFY67-08:  $V_{DS} = 2\text{ V}$ ,  $I_D = 15\text{ mA}$ ,  $Z_0 = 50\ \Omega$ 

<i>f</i>	$S_{11}$		$S_{21}$		$S_{12}$		$S_{22}$		k-Fact.	$S_{21}/S_{12}$	MAG
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG			
16	0.502	91	2.735	-61	0.109	-71	0.305	-177	1.18	14	11.4
16.5	0.499	82	2.719	-68	0.1091	-77	0.301	177	1.19	14	11.3
17	0.498	74	2.722	-75	0.1097	-82	0.297	172	1.19	13.9	11.3
17.5	0.498	68	2.741	-80	0.1103	-87	0.294	168	1.18	14	11.4
18	0.498	62	2.76	-84	0.1107	-90	0.29	165	1.17	14	11.5

**Typical Common Source S-Parameters**

 CFY67-06:  $V_{DS} = 2\text{ V}$ ,  $I_D = 15\text{ mA}$ ,  $Z_0 = 50\ \Omega$ 

<i>f</i>	<i>S</i> <sub>11</sub>		<i>S</i> <sub>21</sub>		<i>S</i> <sub>12</sub>		<i>S</i> <sub>22</sub>		k-Fact.	<i>S</i> <sub>21</sub> / <i>S</i> <sub>12</sub>	MAG
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	MAG	dB	dB
0.5	0.962	-13	6.112	166	0.0111	76	0.539	-15	0.42	27.4	-
1	0.937	-22	5.956	159	0.0211	69	0.525	-19	0.42	24.5	-
1.5	0.913	-33	5.81	150	0.0302	64	0.511	-24	0.44	22.8	-
2	0.889	-41	5.69	142	0.0394	58	0.498	-30	0.46	21.6	-
2.5	0.86	-51	5.522	133	0.0484	53	0.484	-36	0.48	20.6	-
3	0.834	-61	5.386	124	0.0567	48	0.469	-43	0.5	19.8	-
3.5	0.81	-71	5.236	116	0.0637	43	0.456	-49	0.52	19.1	-
4	0.784	-80	5.067	107	0.0702	38	0.44	-55	0.55	18.6	-
4.5	0.761	-90	4.911	99	0.076	33	0.423	-61	0.58	18.1	-
5	0.74	-99	4.752	91	0.0809	28	0.41	-67	0.6	17.7	-
5.5	0.72	-107	4.586	84	0.0851	24	0.397	-73	0.63	17.3	-
6	0.701	-116	4.42	76	0.0889	19	0.385	-79	0.66	17	-
6.5	0.682	-124	4.26	69	0.0918	15	0.373	-84	0.69	16.7	-
7	0.663	-131	4.107	62	0.0941	11	0.362	-89	0.73	16.4	-
7.5	0.644	-139	3.974	55	0.0962	7	0.351	-93	0.77	16.2	-
8	0.627	-148	3.852	49	0.098	3	0.343	-98	0.8	15.9	-
8.5	0.611	-157	3.747	42	0.0995	-1	0.333	-102	0.83	15.8	-
9	0.595	-165	3.659	35	0.1008	-5	0.323	-107	0.86	15.6	-
9.5	0.581	-173	3.571	29	0.1022	-9	0.313	-112	0.9	15.4	-
10	0.567	178	3.497	22	0.1039	-13	0.303	-116	0.92	15.3	-
10.5	0.556	170	3.43	16	0.1049	-17	0.293	-121	0.95	15.1	-
11	0.546	163	3.368	9	0.1064	-21	0.284	-127	0.98	15	-
11.5	0.537	155	3.317	3	0.1078	-26	0.274	-131	1	14.9	-
12	0.528	149	3.265	-4	0.1093	-30	0.265	-135	1.02	14.8	13.8
12.5	0.52	142	3.216	-10	0.1105	-35	0.255	-139	1.05	14.6	13.3
13	0.513	135	3.169	-17	0.1116	-39	0.246	-143	1.07	14.5	12.9
13.5	0.506	128	3.12	-24	0.1126	-44	0.235	-146	1.1	14.4	12.5
14	0.498	121	3.08	-30	0.1137	-49	0.225	-150	1.12	14.3	12.2
14.5	0.492	113	3.044	-37	0.1151	-54	0.215	-155	1.14	14.2	12
15	0.489	106	3.014	-44	0.116	-59	0.207	-159	1.15	14.1	11.8
15.5	0.484	98	2.99	-51	0.1171	-65	0.2	-163	1.16	14.1	11.6

**Typical Common Source S-Parameters**

 CFY67-06:  $V_{DS} = 2 \text{ V}$ ,  $I_D = 15 \text{ mA}$ ,  $Z_0 = 50 \Omega$ 

<i>f</i> GHz	<i>S</i> <sub>11</sub>		<i>S</i> <sub>21</sub>		<i>S</i> <sub>12</sub>		<i>S</i> <sub>22</sub>		k-Fact.	<i>S</i> <sub>21</sub> / <i>S</i> <sub>12</sub>	MAG
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	MAG	dB	dB
16	0.485	91	2.967	-58	0.1185	-71	0.193	-167	1.17	14	11.5
16.5	0.485	83	2.945	-65	0.1197	-77	0.187	-171	1.17	13.9	11.4
17	0.485	75	2.947	-71	0.1206	-82	0.182	-175	1.17	13.9	11.4
17.5	0.487	69	2.961	-77	0.1215	-87	0.177	-178	1.16	13.9	11.5
18	0.49	64	2.979	-81	0.123	-90	0.174	179	1.14	13.8	11.6

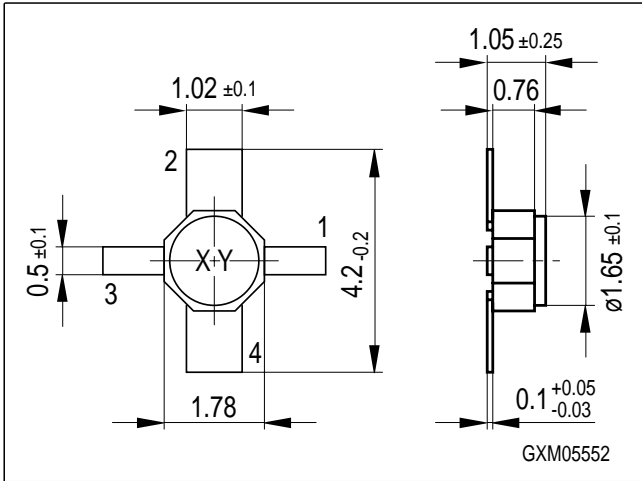
**Typical Common Source Noise- Parameters**

 CFY67-08:  $V_{DS} = 2 \text{ V}$ ,  $I_D = 15 \text{ mA}$ ,  $Z_0 = 50 \Omega$ 

$f$	$NF_{min}$	$ \Gamma_{opt} $	$\angle \Gamma_{opt}$	$R_n$
GHz	dB	MAGN	ANGLE	$\Omega$
1	0.29	0.756	14	15.6
2	0.3	0.69	28	14.65
3	0.34	0.643	43	13.56
4	0.38	0.606	58	12.1
5	0.41	0.578	73	10.53
6	0.46	0.553	87	8.86
7	0.5	0.534	102	7.16
8	0.55	0.518	116	5.62
9	0.6	0.505	131	4.29
10	0.64	0.495	145	3.23
11	0.69	0.486	159	2.53
12	0.73	0.476	173	2.22
13	0.78	0.467	-173	2.37
14	0.84	0.455	-160	2.96
15	0.88	0.443	-146	4.01
16	0.93	0.428	-132	5.47
17	0.99	0.412	-118	7.26
18	1.05	0.394	-103	9.61



### Micro-X Package



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