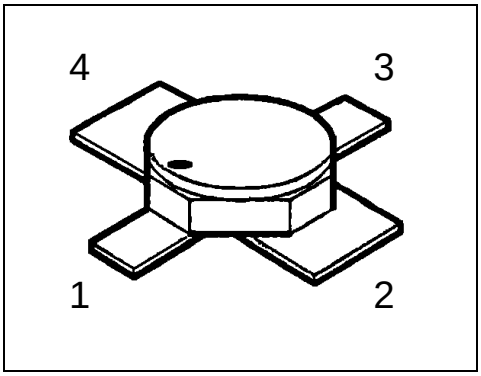
HiRel K-Band GaAs Super Low Noise HEMT

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



ESD: **E**lectro**s**tatic **d**ischarge sensitive device, observe handling precautions!

Type	Marking	Ordering Code	Pin Configuration				Package
			1	2	3	4	
CFY67-08 (ql) CFY67-08P (ql) CFY67-10 (ql) CFY67-10P (ql)	-	see below	G	S	D	S	Micro-X

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

(ql) Quality Level: P: Professional Quality
H: High Rel Quality
S: Space Quality
ES: ESA Space Quality

(see order instructions for ordering example)

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	3.5	V
Drain-gate voltage	V_{DG}	4.5	V
Gate-source voltage (reverse / forward)	V_{GS}	- 3... + 0.5	V
Drain current	I_D	60	mA
Gate forward current	I_G	2	mA
RF Input Power, C- and X-Band [1)]	$P_{RF,in}$	+ 10	dBm
Junction temperature	T_J	150	°C
Storage temperature range	T_{stg}	- 65... + 150	°C
Total power dissipation [2)]	P_{tot}	200	mW
Soldering temperature [3)]	T_{sol}	230	°C
Thermal Resistance			
Junction-soldering point	$R_{th\ JS}$	≤ 515 (tbc.)	K/W

Notes.:

1) For $V_{DS} \leq 2$ V. For $V_{DS} > 2$ V, derating is required.
2) At $T_S = + 47$ °C. For $T_S > + 47$ °C derating is required.
3) During 15 sec. maximum. The same terminal shall not be resoldered until 3 minutes have elapsed.

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	2.0	V
Drain current at 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	µA
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
Thermal resistance junction to soldering point	$R_{th\ JS}$	-	450	-	K/W

Electrical Characteristics (continued)

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics					
Noise figure [1)] V_{DS} = 2 V, I_D = 15 mA, f = 12 GHz	NF				dB
CFY67-08, -08P		-	0.7	0.8	
CFY67-10, 10P		-	0.9	1.0	
Associated gain. [1)] V_{DS} = 2 V, I_D = 15 mA, f = 12 GHz	G_a				dB
CFY67-08, -08P		11.0	11.5	-	
CFY67-10, 10P		10.5	11.0	-	
Output power at 1 dB gain compression [2)] V_{DS} = 2 V, I_D = 20 mA, f = 12 GHz	P_{1dB}				dBm
CFY67-08, -10		-	11.0	-	
CFY67-08P, -10P		10.0	11.0	-	

Notes.:

1) Noise figure / sssociated gain characteristics given for minimum noise figure matching conditions (fixed generic matching, no fine-tuning).

2) Output power characteristics given for optimum output power matching conditions (fixed generic matching, no fine-tuning).

Typical Common Source S-Parameters

CFY67-08: V_{DS} = 2 V, I_D = 15 mA, Z_o = 50 Ω											
f	|S11|	<S11	|S21|	<S21	|S12|	<S12	|S22|	<S22	k-Fact.	S_{21}/S_{12}	MAG
[GHz]	[magn]	[angle]	[magn]	[angle]	[magn]	[angle]	[magn]	[angle]	[magn]	[dB]	[dB]
0,5	0,963	-15	5,315	165	0,0111	74	0,655	-14	0,40	26,8	
1,0	0,938	-23	5,182	159	0,0225	68	0,639	-18	0,39	23,6	
1,5	0,913	-33	5,060	150	0,0317	62	0,625	-23	0,42	22,0	
2,0	0,889	-42	4,940	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	0,844	-62	4,715	124	0,0585	46	0,582	-41	0,45	19,1	
3,5	0,823	-72	4,591	115	0,0650	41	0,567	-47	0,47	18,5	
4,0	0,800	-81	4,450	107	0,0714	36	0,552	-53	0,50	17,9	
4,5	0,779	-91	4,319	99	0,0768	31	0,534	-60	0,52	17,5	
5,0	0,761	-100	4,183	91	0,0811	25	0,520	-66	0,54	17,1	
5,5	0,743	-109	4,043	83	0,0850	20	0,500	-72	0,58	16,8	
6,0	0,725	-117	3,906	75	0,0885	15	0,490	-77	0,60	16,4	
6,5	0,708	-125	3,769	68	0,0917	11	0,477	-83	0,63	16,1	
7,0	0,690	-132	3,640	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	0,656	-146	3,427	48	0,0978	-1	0,442	-97	0,76	15,4	
8,5	0,640	-153	3,344	41	0,0998	-5	0,430	-101	0,79	15,3	
9,0	0,625	-160	3,271	34	0,1010	-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	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	0,576	169	3,041	8	0,1056	-24	0,370	-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	0,554	154	2,960	-5	0,1070	-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	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	0,330	-151	1,09	14,2	12,4
14,0	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	0,320	-161	1,13	14,1	11,9
15,0	0,510	108	2,765	-46	0,1093	-60	0,315	-167	1,14	14,0	11,7
15,5	0,505	99	2,751	-54	0,1090	-65	0,311	-172	1,16	14,0	11,6
16,0	0,502	91	2,735	-61	0,1090	-71	0,305	-177	1,18	14,0	11,4
16,5	0,499	82	2,719	-68	0,1091	-77	0,301	177	1,19	14,0	11,3
17,0	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	14,0	11,4
18,0	0,498	62	2,760	-84	0,1107	-90	0,290	165	1,17	14,0	11,5

Typical Common Source S-Parameters (continued)

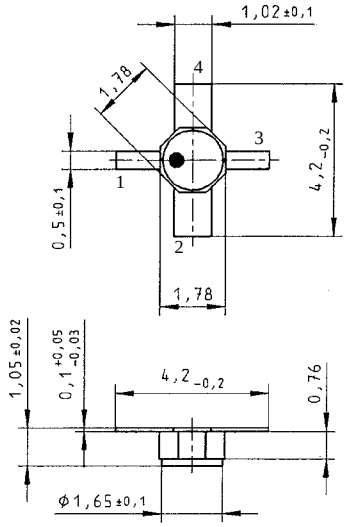
CFY67-06: V_{DS} = 2 V, I_D = 15 mA, Z_o = 50 Ω

f	|S11|	<S11	|S21|	<S21	|S12|	<S12	|S22|	<S22	k-Fact.	S_{21}/S_{12}	MAG
[GHz]	[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	0,937	-22	5,956	159	0,0211	69	0,525	-19	0,42	24,5	
1,5	0,913	-33	5,810	150	0,0302	64	0,511	-24	0,44	22,8	
2,0	0,889	-41	5,690	142	0,0394	58	0,498	-30	0,46	21,6	
2,5	0,860	-51	5,522	133	0,0484	53	0,484	-36	0,48	20,6	
3,0	0,834	-61	5,386	124	0,0567	48	0,469	-43	0,50	19,8	
3,5	0,810	-71	5,236	116	0,0637	43	0,456	-49	0,52	19,1	
4,0	0,784	-80	5,067	107	0,0702	38	0,440	-55	0,55	18,6	
4,5	0,761	-90	4,911	99	0,0760	33	0,423	-61	0,58	18,1	
5,0	0,740	-99	4,752	91	0,0809	28	0,410	-67	0,60	17,7	
5,5	0,720	-107	4,586	84	0,0851	24	0,397	-73	0,63	17,3	
6,0	0,701	-116	4,420	76	0,0889	19	0,385	-79	0,66	17,0	
6,5	0,682	-124	4,260	69	0,0918	15	0,373	-84	0,69	16,7	
7,0	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	0,627	-148	3,852	49	0,0980	3	0,343	-98	0,80	15,9	
8,5	0,611	-157	3,747	42	0,0995	-1	0,333	-102	0,83	15,8	
9,0	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	0,90	15,4	
10,0	0,567	178	3,497	22	0,1039	-13	0,303	-116	0,92	15,3	
10,5	0,556	170	3,430	16	0,1049	-17	0,293	-121	0,95	15,1	
11,0	0,546	163	3,368	9	0,1064	-21	0,284	-127	0,98	15,0	
11,5	0,537	155	3,317	3	0,1078	-26	0,274	-131	1,00	14,9	
12,0	0,528	149	3,265	-4	0,1093	-30	0,265	-135	1,02	14,8	13,8
12,5	0,520	142	3,216	-10	0,1105	-35	0,255	-139	1,05	14,6	13,3
13,0	0,513	135	3,169	-17	0,1116	-39	0,246	-143	1,07	14,5	12,9
13,5	0,506	128	3,120	-24	0,1126	-44	0,235	-146	1,10	14,4	12,5
14,0	0,498	121	3,080	-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	12,0
15,0	0,489	106	3,014	-44	0,1160	-59	0,207	-159	1,15	14,1	11,8
15,5	0,484	98	2,990	-51	0,1171	-65	0,200	-163	1,16	14,1	11,6
16,0	0,485	91	2,967	-58	0,1185	-71	0,193	-167	1,17	14,0	11,5
16,5	0,485	83	2,945	-65	0,1197	-77	0,187	-171	1,17	13,9	11,4
17,0	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	0,490	64	2,979	-81	0,1230	-90	0,174	179	1,14	13,8	11,6

Typical Common Source Noise-Parameters

CFY67-08: V_{DS} = 2 V, I_D = 15 mA, Z_o = 50 □				
f	NF_{min}	|□$_{opt}$|	<□$_{opt}$	R_n
[GHz]	[dB]	[magn]	[angle]	[□]
1	0,29	0,756	14	15,60
2	0,30	0,690	28	14,65
3	0,34	0,643	43	13,56
4	0,38	0,606	58	12,10
5	0,41	0,578	73	10,53
6	0,46	0,553	87	8,86
7	0,50	0,534	102	7,16
8	0,55	0,518	116	5,62
9	0,60	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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