

HiRel Ku-Band GaAs General Purpose MESFET

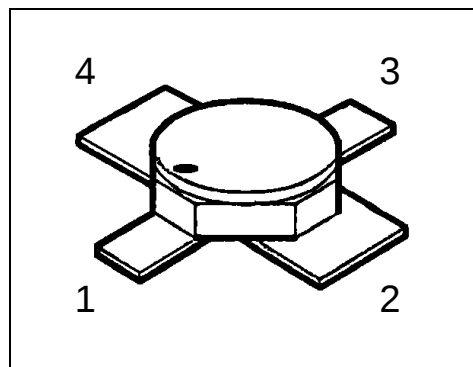
- **HiRel Discrete and Microwave Semiconductor**

- For professional pre- and driver-amplifiers
- For frequencies from 500 MHz to 20 GHz
- Hermetically sealed microwave package
- High gain, medium power

- **Component Under Development**

- **ESA Space Qualification Expected 1998**

ESA/SCC Detail Spec. No.: 5613/008,
Type Variant No.s 06 and 07 foreseen (tbc.)



ESD: Electrostatic discharge sensitive device, observe handling precautions!

Type	Marking	Ordering Code	Pin Configuration				Package
			1	2	3	4	
CFY27-38 (ql)	-	see below	G	S	D	S	Micro-X
CFY27-P (ql)							

CFY27-nnl: specifies gain and output power levels (see electrical characteristics)

(ql) Quality Level:	P: Professional Quality,	Ordering Code:	Q62703F121
	H: High Rel Quality,	Ordering Code:	on request
	S: Space Quality,	Ordering Code:	on request
	ES: ESA Space Quality,	Ordering Code:	on request

(see order instructions for ordering example)

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	9	V
Drain-gate voltage	V_{DG}	11	V
Gate-source voltage (reverse / forward)	V_{GS}	- 6... + 0.5	V
Drain current	I_D	420	mA
Gate forward current	I_G	5	mA
RF Input Power, C- and X-Band ¹⁾	$P_{RF,in}$	+ 20 (tbc.)	dBm
Junction temperature	T_J	175	°C
Storage temperature range	T_{stg}	- 65... + 175	°C
Total power dissipation ²⁾	P_{tot}	900	mW
Soldering temperature ³⁾	T_{sol}	230	°C

Thermal Resistance

Junction-soldering point	$R_{th,JS}$	≤ 150 (tbc.)	K/W
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Notes.:

- 1) For $V_{DS} \leq 5$ V. For $V_{DS} > 5$ V, derating is required.
- 2) At $T_S = + 40$ °C. For $T_S > + 40$ °C derating is required.
- 3) During 15 sec. maximum. The same terminal shall not be resoldered until 3 minutes have elapsed.

Electrical Characteristics (at $T_A=25^{\circ}\text{C}$; unless otherwise specified)

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
DC Characteristics					
Drain-source saturation current $V_{DS} = 2\text{ V}$, $V_{GS} = 0\text{ V}$	I_{DSS}	150	270	420	mA
Gate threshold voltage $V_{DS} = 3\text{ V}$, $I_D = 1\text{ mA}$	$-V_{Gth}$	1.0	2.0	3.2	V
Drain current at pinch-off $V_{DS} = 3\text{ V}$, $V_{GS} = -4\text{ V}$	I_{Dp}	-	< 12	60	μA
Gate leakage current at pinch-off $V_{DS} = 3\text{ V}$, $V_{GS} = -4\text{ V}$	$-I_{Gp}$	-	< 12	30	μA
Transconductance $V_{DS} = 3\text{ V}$, $I_D = 120\text{ mA}$	g_{m120}	130	160	-	mS
Gate leakage current at operation $V_{DS} = 3\text{ V}$, $I_D = 120\text{ mA}$	$-I_{G120}$	-	< 3	-	μA
Thermal resistance junction to soldering point	$R_{th\text{ JS}}$	-	125	-	K/W

Electrical Characteristics (continued)

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
AC Characteristics					
Noise figure ¹⁾ V _{DS} = 3 V, I _D = 120 mA, f = 12 GHz CFY27-P CFY27-38	NF	- -	< 3.6 3.5	- 3.8	dB
Associated gain. ¹⁾ V _{DS} = 3 V, I _D = 120 mA, f = 12 GHz CFY27-P CFY27-38	G _a	- 7.5	> 7.8 8.0	- -	dB
Output power at 1 dB gain compression ²⁾ V _{DS} = 5 V, I _{D(RF off)} = 120 mA, f = 2.3 GHz CFY27-P CFY27-38	P _{1dB}	24.5 -	26 > 25	- -	dBm
Linear power gain ²⁾ V _{DS} = 5 V, I _D = 120 mA, f = 2.3 GHz, P _{in} = 0 dBm CFY27-P CFY27-38	G _{lp}	17.5 -	19 > 18	- -	dB

Notes.:

- 1) Noise figure / associated gain characteristics given for minimum noise figure matching conditions (fixed generic matching, no fine-tuning).
- 2) Output power / linear power gain characteristics given for optimum output power matching conditions (fixed generic matching, no fine-tuning).

Typical Common Source S-Parameters CFY27

$V_{DS} = 3 \text{ V}, I_D = 120 \text{ mA}, Z_0 = 50 \Omega$											
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	0,936	-43	8,720	153	0,0203	68	0,149	-55	0,33	26,3	
0,6	0,921	-50	8,470	148	0,0245	65	0,151	-64	0,35	25,4	
0,7	0,904	-55	8,200	143	0,0280	61	0,153	-72	0,38	24,7	
0,8	0,890	-62	7,943	138	0,0311	57	0,156	-81	0,41	24,1	
0,9	0,876	-68	7,698	135	0,0333	54	0,161	-87	0,43	23,6	
1,0	0,864	-74	7,449	130	0,0357	51	0,164	-94	0,46	23,2	
1,1	0,854	-80	7,198	126	0,0383	49	0,169	-100	0,47	22,7	
1,2	0,846	-86	6,948	122	0,0407	46	0,173	-105	0,48	22,3	
1,3	0,837	-91	6,702	119	0,0419	44	0,179	-110	0,51	22,0	
1,4	0,830	-96	6,465	115	0,0435	43	0,186	-114	0,52	21,7	
1,5	0,823	-101	6,240	112	0,0448	41	0,190	-118	0,54	21,4	
1,6	0,816	-106	5,990	109	0,0461	39	0,194	-122	0,57	21,1	
1,7	0,810	-110	5,805	106	0,0475	38	0,199	-125	0,58	20,9	
1,8	0,804	-114	5,603	103	0,0486	36	0,203	-128	0,61	20,6	
1,9	0,799	-118	5,410	100	0,0494	34	0,208	-131	0,63	20,4	
2,0	0,795	-122	5,225	97	0,0502	33	0,212	-134	0,65	20,2	
2,1	0,791	-126	5,030	94	0,0508	32	0,216	-137	0,68	20,0	
2,2	0,788	-130	4,877	92	0,0513	31	0,219	-139	0,70	19,8	
2,3	0,784	-133	4,718	89	0,0519	30	0,222	-142	0,73	19,6	
2,4	0,781	-136	4,569	87	0,0524	29	0,225	-144	0,75	19,4	
2,5	0,779	-139	4,429	84	0,0528	28	0,227	-147	0,78	19,2	
2,6	0,776	-142	4,296	82	0,0532	27	0,229	-149	0,80	19,1	
2,7	0,773	-145	4,170	80	0,0537	26	0,232	-150	0,83	18,9	
2,8	0,771	-148	4,047	78	0,0540	25	0,235	-152	0,85	18,7	
2,9	0,769	-150	3,936	76	0,0543	25	0,237	-154	0,88	18,6	
3,0	0,767	-153	3,829	74	0,0545	24	0,240	-155	0,91	18,5	
3,1	0,765	-155	3,729	72	0,0547	24	0,242	-157	0,93	18,3	
3,2	0,764	-157	3,633	70	0,0550	23	0,244	-159	0,96	18,2	
3,3	0,763	-160	3,539	68	0,0554	23	0,246	-160	0,98	18,1	
3,4	0,762	-162	3,450	66	0,0556	22	0,249	-162	1,01	17,9	17,5
3,5	0,761	-164	3,367	64	0,0559	22	0,251	-164	1,03	17,8	16,8
4,0	0,758	-174	3,014	54	0,0574	21	0,266	-171	1,13	17,2	15,0
4,5	0,757	177	2,713	46	0,0594	20	0,283	-178	1,21	16,6	13,8
5,0	0,759	169	2,513	38	0,0620	20	0,300	177	1,25	16,1	13,1
5,5	0,761	161	2,310	30	0,0644	19	0,316	171	1,30	15,5	12,3
6,0	0,763	154	2,133	22	0,0676	18	0,332	166	1,32	15,0	11,6
6,5	0,764	147	1,983	15	0,0709	17	0,349	160	1,35	14,5	10,9
7,0	0,766	140	1,856	8	0,0751	15	0,366	154	1,35	13,9	10,4
7,5	0,768	133	1,747	0	0,0801	14	0,381	149	1,33	13,4	9,9
8,0	0,771	126	1,649	-8	0,0849	11	0,398	142	1,32	12,9	9,5
8,5	0,775	119	1,561	-16	0,0891	8	0,414	137	1,30	12,4	9,1
9,0	0,780	111	1,478	-23	0,0937	5	0,431	131	1,28	12,0	8,8
9,5	0,787	104	1,401	-31	0,0981	2	0,450	125	1,24	11,5	8,6
10,0	0,794	97	1,329	-39	0,1022	-2	0,469	119	1,21	11,1	8,4
10,5	0,802	90	1,262	-47	0,1057	-7	0,488	112	1,18	10,8	8,2
11,0	0,810	83	1,198	-55	0,1083	-11	0,505	106	1,16	10,4	8,0
11,5	0,816	77	1,138	-62	0,1106	-16	0,525	99	1,14	10,1	7,8
12,0	0,823	70	1,081	-70	0,1126	-20	0,547	93	1,13	9,8	7,7
12,5	0,829	63	1,026	-78	0,1138	-26	0,566	86	1,11	9,5	7,5
13,0	0,835	56	0,974	-86	0,1144	-31	0,584	80	1,10	9,3	7,4
13,5	0,841	49	0,925	-94	0,1137	-37	0,601	73	1,10	9,1	7,2
14,0	0,846	41	0,881	-102	0,1128	-42	0,616	67	1,10	8,9	7,0
14,5	0,851	34	0,839	-110	0,1110	-48	0,631	59	1,11	8,8	6,8
15,0	0,857	27	0,793	-119	0,1084	-54	0,648	52	1,12	8,6	6,6
15,5	0,863	20	0,748	-127	0,1047	-60	0,666	44	1,13	8,5	6,4
16,0	0,869	12	0,702	-137	0,0997	-67	0,688	36	1,14	8,5	6,2
16,5	0,874	5	0,652	-147	0,0943	-73	0,713	27	1,17	8,4	5,9
17,0	0,881	-1	0,602	-157	0,0892	-78	0,741	20	1,16	8,3	5,9
17,5	0,887	-7	0,555	-166	0,0845	-83	0,772	13	1,12	8,2	6,1
18,0	0,895	-12	0,514	-176	0,0805	-87	0,805	6	1,04	8,1	6,9

Typical Common Source S-Parameters CFY25-20 (continued)

$V_{DS} = 5\text{ V}, I_D = 1.20\text{ mA}, Z_0 = 50\ \Omega$											
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	0,937	-44	9,390	149	0,0152	65	0,319	-27	0,38	27,9	
0,6	0,922	-50	9,010	146	0,0183	63	0,314	-30	0,40	26,9	
0,7	0,905	-56	8,720	141	0,0207	61	0,309	-34	0,44	26,2	
0,8	0,889	-61	8,370	138	0,0231	58	0,303	-37	0,48	25,6	
0,9	0,876	-67	8,083	134	0,0255	55	0,298	-41	0,50	25,0	
1,0	0,866	-73	7,823	130	0,0273	52	0,292	-45	0,51	24,6	
1,1	0,857	-79	7,560	126	0,0289	50	0,287	-49	0,53	24,2	
1,2	0,848	-85	7,305	122	0,0304	48	0,282	-52	0,55	23,8	
1,3	0,839	-90	7,046	118	0,0315	45	0,278	-55	0,58	23,5	
1,4	0,832	-96	6,798	114	0,0326	43	0,275	-59	0,60	23,2	
1,5	0,826	-100	6,561	111	0,0335	42	0,272	-62	0,62	22,9	
1,6	0,819	-105	6,327	108	0,0343	40	0,269	-64	0,65	22,7	
1,7	0,813	-109	6,100	104	0,0348	39	0,268	-67	0,68	22,4	
1,8	0,807	-114	5,886	101	0,0355	38	0,266	-70	0,71	22,2	
1,9	0,804	-118	5,681	98	0,0360	37	0,265	-73	0,73	22,0	
2,0	0,800	-121	5,485	95	0,0364	35	0,264	-76	0,76	21,8	
2,1	0,796	-125	5,298	93	0,0368	34	0,263	-79	0,79	21,6	
2,2	0,793	-129	5,122	90	0,0371	34	0,263	-81	0,82	21,4	
2,3	0,790	-132	4,957	87	0,0375	33	0,263	-84	0,84	21,2	
2,4	0,788	-135	4,800	85	0,0379	32	0,263	-86	0,87	21,0	
2,5	0,785	-138	4,654	82	0,0381	32	0,263	-88	0,90	20,9	
2,6	0,784	-141	4,515	80	0,0384	31	0,264	-90	0,93	20,7	
2,7	0,782	-144	4,381	78	0,0386	31	0,265	-92	0,95	20,6	
2,8	0,780	-147	4,253	75	0,0390	31	0,266	-94	0,98	20,4	
2,9	0,778	-149	4,136	73	0,0392	31	0,266	-96	1,01	20,2	19,6
3,0	0,776	-152	4,020	71	0,0394	31	0,267	-98	1,04	20,1	18,9
3,1	0,775	-154	3,912	69	0,0396	30	0,269	-100	1,07	19,9	18,4
3,2	0,774	-156	3,811	67	0,0398	30	0,270	-102	1,09	19,8	17,9
3,3	0,773	-159	3,714	65	0,0401	30	0,272	-104	1,12	19,7	17,6
3,4	0,773	-161	3,621	63	0,0403	30	0,273	-106	1,14	19,5	17,3
3,5	0,772	-163	3,534	61	0,0406	30	0,274	-108	1,16	19,4	17,0
4,0	0,773	-173	3,163	51	0,0421	32	0,285	-116	1,24	18,8	15,8
4,5	0,774	177	2,869	42	0,0446	34	0,301	-125	1,27	18,1	14,9
5,0	0,777	169	2,600	34	0,0480	37	0,321	-134	1,29	17,3	14,1
5,5	0,779	161	2,383	26	0,0522	38	0,343	-143	1,27	16,6	13,5
6,0	0,781	154	2,195	18	0,0574	39	0,366	-151	1,24	15,8	12,9
6,5	0,784	147	2,035	10	0,0642	39	0,392	-159	1,16	15,0	12,6
7,0	0,787	140	1,918	1	0,0711	37	0,413	-166	1,09	14,3	12,5
7,5	0,791	133	1,777	-7	0,0782	35	0,434	-174	1,04	13,6	12,3
8,0	0,796	126	1,672	-15	0,0859	32	0,452	179	0,98	12,9	
8,5	0,801	119	1,576	-23	0,0937	28	0,470	171	0,92	12,3	
9,0	0,808	111	1,486	-32	0,1019	24	0,490	163	0,87	11,6	
9,5	0,816	104	1,404	-40	0,1092	19	0,514	154	0,82	11,1	
10,0	0,824	97	1,326	-48	0,1156	15	0,534	145	0,78	10,6	
10,5	0,833	90	1,252	-56	0,1216	9	0,555	136	0,75	10,1	
11,0	0,842	83	1,181	-64	0,1270	4	0,578	127	0,72	9,7	
11,5	0,850	76	1,115	-72	0,1316	-2	0,603	119	0,68	9,3	
12,0	0,857	69	1,051	-81	0,1348	-8	0,628	111	0,65	8,9	
12,5	0,862	62	0,990	-89	0,1372	-14	0,648	103	0,63	8,6	
13,0	0,866	55	0,932	-97	0,1390	-21	0,670	96	0,61	8,3	
13,5	0,871	48	0,877	-105	0,1401	-27	0,688	88	0,60	8,0	
14,0	0,874	40	0,822	-114	0,1403	-33	0,705	80	0,60	7,7	
14,5	0,878	33	0,765	-122	0,1385	-40	0,721	72	0,60	7,4	
15,0	0,881	25	0,721	-131	0,1355	-47	0,739	64	0,61	7,3	
15,5	0,883	18	0,666	-140	0,1312	-53	0,752	55	0,63	7,1	
16,0	0,886	11	0,617	-150	0,1254	-60	0,772	46	0,64	6,9	
16,5	0,890	4	0,558	-159	0,1180	-66	0,793	37	0,66	6,7	
17,0	0,892	-3	0,510	-169	0,1112	-72	0,814	30	0,67	6,6	
17,5	0,897	-8	0,464	-178	0,1049	-80	0,834	21	0,62	6,5	
18,0	0,901	-15	0,421	173	0,0994	-86	0,858	13	0,60	6,3	

Order Instructions:

Full type variant including quality level must be specified by the orderer. For *HiRel* Discrete and Microwave Semiconductors the ordering code specifies device family and quality level only.

Ordering Form:

Ordering Code: Q.....
CFY27 -(nnl) (ql)
-(nnl): Noise Figure and/or Power Level
(ql): Quality Level

Ordering Example:

Ordering Code: Q62703F121
CFY27-P P
For CFY27, Gain/Power Level P:
 $P_{1dB} > 25 \text{ dBm}$
in Professional Quality Level

Further Informations:

See our WWW-Pages:

- Discrete and RF-Semiconductors (Small Signal Semiconductors)

www.infineon.com/products/discrete/hirel.htm

- *HiRel* Discrete and Microwave Semiconductors

www.infineon.com/products/discrete/hirel.htm

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Micro-X Package

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