

High-Power Packaged GaAs FET

Description

The CLY5 is a high-breakdown voltage GaAs FET designed for power amplifier applications in the 400 MHz to 2.5 GHz frequency range. It is ideal for portable PA applications in mobile phones and portable WLAN transceivers due to its easy matching and excellent linearity. The CLY5 exhibits +26.5 dBm output power with +3V Vds at 1.8 GHz with an associated gain of 9.5 dB. Power added efficiencies to 55% are achievable.

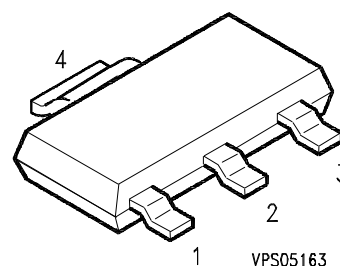
Features

- For frequencies up to 2.5 GHz
- Wide operating voltage range:
2.7 to 6 V
- P_{OUT} 26.5 dBm typical at $V_D=3V$,
 $f=1.8GHz$
- High efficiency: better than 55 %
- Low Cost

Applications

- Power amplifier for mobile phones
- Power Amplifiers for WLAN transceivers
- Driver Amplifiers for WLAN or mobile phone basestations

Package Outline, SOT223



Pin Configuration:

- 1: Gate
- 2 & 4: Source
- 3: Drain

Maximum Ratings

Parameter	Symbol	Values	Unit
Drain-source voltage	V_{DS}	9	V
Drain-gate voltage	V_{DG}	12	V
Gate-source voltage	V_{GS}	-6	V
Drain current	I_D	1.2	A
Channel temperature	T_{Ch}	150	°C
Storage temperature	T_{stg}	-55...+150	°C
Pulse peak power	P_{Pulse}	9	W
Total power dissipation ($T_S \leq 80\text{ °C}$) T_S: Temperature at soldering point	P_{tot}	2	W

Thermal Resistance

Channel-soldering point	R_{thChS}	≤ 35	K/W
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Electrical Characteristics

($T_A = 25^\circ\text{C}$, unless otherwise specified)

Parameter	Symbol	min	typ	max	Unit
Drain-source saturation current $V_{DS} = 3\text{ V}$ $V_{GS} = 0\text{ V}$	I_{DSS}	600	800	1000	mA
Drain-source pinch-off current $V_{DS} = 3\text{ V}$ $V_{GS} = -3.8\text{ V}$	I_D	-	10	100	μA
Gate pinch-off current $V_{DS} = 3\text{ V}$ $V_{GS} = -3.8\text{ V}$	I_G	-	5	20	μA
Pinch-off Voltage $V_{DS} = 3\text{ V}$ $I_D = 100\mu\text{A}$	$V_{GS(p)}$	-3.8	-2.8	-1.8	V
Small Signal Gain*) $V_{DS} = 3\text{ V}$ $I_D = 350\text{ mA}$ $f = 1.8\text{ GHz}$ $P_{in} = 0\text{ dBm}$	G	10.5	11.0	-	dB
Small Signal Gain*) $V_{DS} = 5\text{ V}$ $I_D = 350\text{ mA}$ $f = 1.8\text{ GHz}$ $P_{in} = 0\text{ dBm}$	G	11.5	12.0	-	dB
Small Signal Gain **) $V_{DS} = 3\text{ V}$ $I_D = 350\text{ mA}$ $f = 1.8\text{ GHz}$ $P_{in} = 0\text{ dBm}$	G_p	9.0	9.5	-	dB
Output Power $V_{DS} = 3\text{ V}$ $I_D = 350\text{ mA}$ $f = 1.8\text{ GHz}$ $P_{in} = 19\text{ dBm}$	P_O	26.5	27	-	dBm
Output Power $V_{DS} = 5\text{ V}$ $I_D = 350\text{ mA}$ $f = 1.8\text{ GHz}$ $P_{in} = 21\text{ dBm}$	P_O	29.5	30	-	dBm
1dB-Compression Point $V_{DS} = 3\text{ V}$ $I_D = 350\text{ mA}$ $f = 1.8\text{ GHz}$	P_{1dB}	-	26.5	-	dBm
1dB-Compression Point $V_{DS} = 5\text{ V}$ $I_D = 350\text{ mA}$ $f = 1.8\text{ GHz}$	P_{1dB}	-	30	-	dBm
Power Added Efficiency $V_{DS} = 5\text{ V}$ $I_D = 350\text{ mA}$ $f = 1.8\text{ GHz}$ $P_{in} = 21\text{ dBm}$	PAE	40	55	-	%
Noise figure $V_{DS} = 5\text{ V}$ $I_D = 350\text{ mA}$ $f = 1.8\text{ GHz}$	NF		1.72		dB

*) Matching conditions for maximum small signal gain (not identical with power matching conditions!)

**) Power matching conditions: $f=1.8\text{GHz}$:

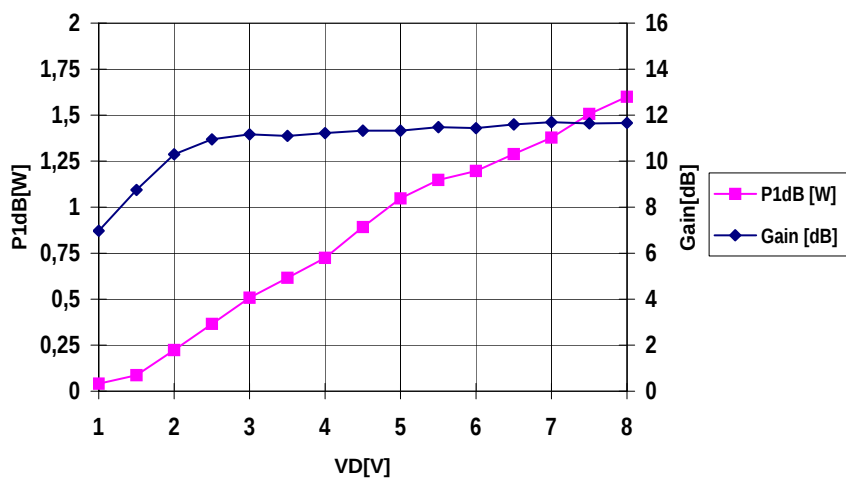
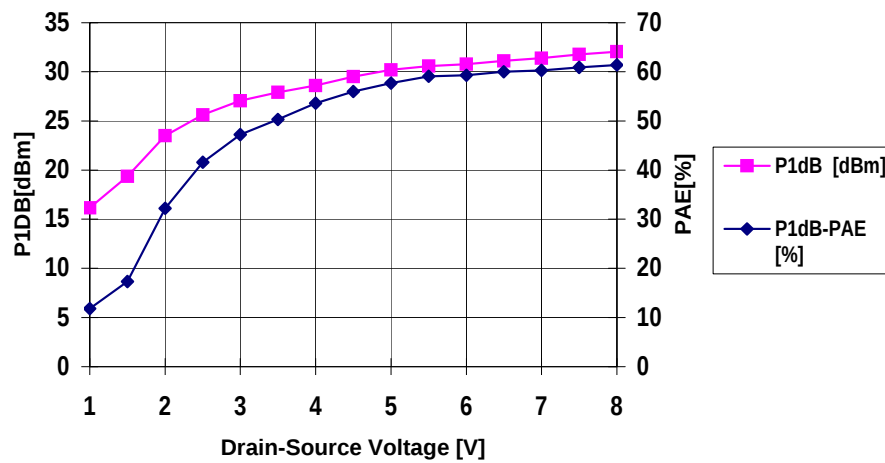
Source Match: Γ_{ms} : MAG 0.58; ANG -143° ; Load Match: Γ_{ml} : MAG 0.76; ANG -116°

Electrical Characteristics (cont)

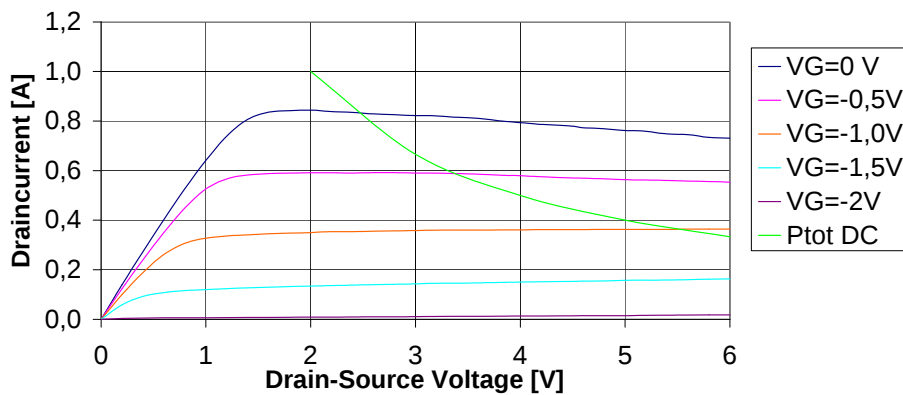
For additional information and latest specifications, see our website: www.triquint.com
Revision E, March 20, 2007

Compression Power vs. Drain-Source Voltage

$f = 1.8\text{GHz}$; $I_{DS0}=350\text{mA}$



Output Characteristics:



Electrical Characteristics (cont)

For additional information and latest specifications, see our website: www.triquint.com
Revision E, March 20, 2007

Typical Common Source S-Parameters and noise data

$V_{DS} = 3\text{ V}$

$I_D = 350\text{ mA}$

$Z_0 = 50\ \Omega$

f MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	0.9702	-30.6	14.9423	158.4	0.0103	85.9	0.2969	-175.8
150	0.9597	-44.7	14.2076	148.9	0.0134	71.7	0.3155	-177.3
200	0.9136	-59.6	13.3921	140.2	0.0189	67.4	0.3309	-175.1
250	0.8786	-71.8	12.5257	131.9	0.0218	66.8	0.3402	-176.1
300	0.8374	-83.2	11.6493	124.9	0.0261	66.1	0.3509	-177.6
400	0.7927	-104.6	10.0502	111.8	0.0318	60.6	0.3793	179.2
500	0.7507	-122.7	8.7221	100.7	0.0374	57.7	0.3970	176.2
600	0.7204	-138.3	7.6207	91.1	0.0424	53.6	0.4130	172.4
700	0.6962	-151.7	6.7149	82.8	0.0477	49.5	0.4283	168.0
800	0.6923	-163.7	5.9699	75.3	0.0519	46.7	0.4377	164.3
900	0.6833	-174.6	5.3660	67.9	0.0562	42.4	0.4501	160.8
1000	0.6829	175.9	4.8399	61.7	0.0614	41.2	0.4596	157.2
1200	0.6922	159.0	4.0337	49.3	0.0687	35.3	0.4811	150.5
1400	0.7041	144.0	3.4168	38.0	0.0761	29.8	0.5035	143.3
1500	0.7130	137.8	3.1757	32.7	0.0813	26.9	0.5133	140.4
1600	0.7197	131.2	2.9317	27.5	0.0849	25.6	0.5259	136.9
1800	0.7414	119.9	2.5649	17.7	0.0919	17.4	0.5478	130.4
2000	0.7622	109.5	2.2367	7.8	0.0967	11.0	0.5701	123.9
2200	0.7798	100.5	1.9842	-1.0	0.1015	6.3	0.5931	117.7
2400	0.8001	92.3	1.7624	-9.6	0.1055	1.1	0.6156	111.3
2500	0.8085	88.3	1.6590	-13.8	0.1083	-2.7	0.6265	108.2
3000	0.8413	71.7	1.2639	-32.5	0.1145	-15.4	0.6780	93.9
3500	0.8723	57.7	1.0034	-49.3	0.1179	-27.8	0.7216	81.3
4000	0.8837	45.5	0.8275	-64.9	0.1257	-39.5	0.7539	69.6
4500	0.8914	34.7	0.7034	-78.3	0.1247	-50.9	0.7710	57.9
5000	0.8985	24.3	0.6140	-91.4	0.1275	-60.8	0.7777	46.7
5500	0.9069	13.6	0.5521	-104.5	0.1361	-71.5	0.7907	34.8
6000	0.9159	2.7	0.5058	-118.6	0.1389	-83.4	0.8089	22.2

f	F_{min}	Γ_{opt}		R_n	r_n
GHz	dB	MAG	ANG	Ω	—
0.9	0.92	0.408	142	3.9	0.79
1.8	1.72	0.664	-134	8.1	0.162

Additional S-Parameter and noise data available on data disc!

Electrical Characteristics (cont)**Typical Common Source S-Parameters and noise data**

$V_{DS} = 5\text{ V}$

$I_D = 350\text{ mA}$

$Z_0 = 50\ \Omega$

f MHz	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
100	0.9678	-31.3	16.8119	158.4	0.0095	85.0	0.1354	-161.6
150	0.9318	-43.8	15.8736	148.9	0.0123	72.8	0.1527	-159.1
200	0.9038	-58.1	15.0157	140.0	0.0165	71.3	0.1634	-156.8
250	0.8699	-70.1	14.0242	132.0	0.0187	66.3	0.1831	-158.0
300	0.8353	-81.9	13.0156	124.7	0.0238	64.5	0.1947	-160.5
400	0.7801	-102.9	11.2669	111.3	0.0286	59.2	0.2278	-165.2
500	0.7343	-120.2	9.8117	100.2	0.0332	56.1	0.2441	-169.2
600	0.7033	-135.4	8.5306	90.5	0.0384	53.9	0.2660	-173.6
700	0.6836	-148.9	7.5315	82.3	0.0422	50.2	0.2790	-178.3
800	0.6692	-161.2	6.7254	74.3	0.0473	51.1	0.2933	178.2
900	0.6638	-172.2	6.0311	66.8	0.0492	44.4	0.3080	174.1
1000	0.6609	178.3	5.4737	60.5	0.0529	42.5	0.3214	170.3
1200	0.6721	161.4	4.5677	47.7	0.0629	39.6	0.3501	162.7
1400	0.6855	146.6	3.8869	36.4	0.0681	34.3	0.3745	156.4
1500	0.6952	139.7	3.5927	30.5	0.0727	31.2	0.3897	153.1
1600	0.7006	133.5	3.3304	24.9	0.0729	28.7	0.4036	149.6
1800	0.7226	122.0	2.9092	14.6	0.0831	24.3	0.4333	143.0
2000	0.7467	111.9	2.5470	4.3	0.0890	16.4	0.4675	136.0
2200	0.7690	102.3	2.2428	-5.2	0.0963	11.8	0.4960	129.5
2400	0.7902	93.9	1.9933	-14.4	0.0979	5.7	0.5287	123.0
2500	0.8006	89.9	1.8674	-18.8	0.1008	2.6	0.5440	119.2
3000	0.8429	73.2	1.4113	-39.3	0.1107	-9.5	0.6182	104.2
3500	0.8759	59.0	1.1024	-57.2	0.1174	-22.2	0.6831	90.0
4000	0.8916	46.9	0.8874	-73.4	0.1231	-35.3	0.7301	77.4
4500	0.8991	35.4	0.7293	-88.1	0.1242	-47.1	0.7573	64.6
5000	0.9035	24.7	0.6214	-101.3	0.1292	-56.0	0.7784	53.0
5500	0.9164	14.0	0.5480	-114.3	0.1338	-67.4	0.7987	40.3
6000	0.9248	2.9	0.4926	-128.3	0.1380	-80.1	0.8228	27.1

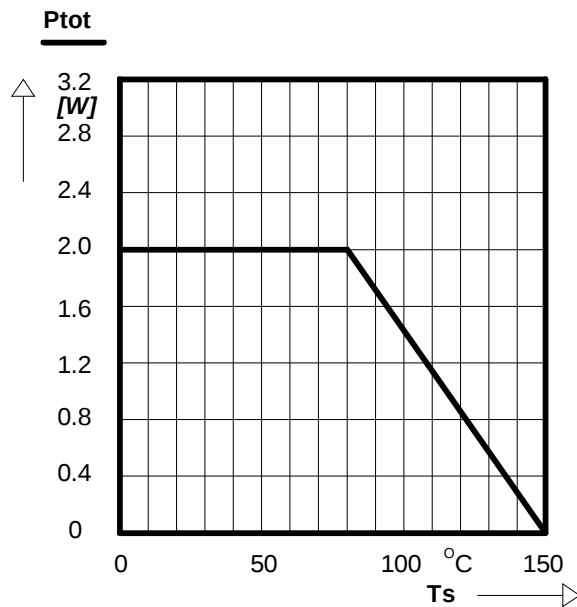
f	F_{min}	Γ_{opt}		R_n	r_n
GHz	dB	MAG	ANG	Ω	—
0.9	1.05	0.369	139	4.9	0.097
1.8	1.94	0.603	-132	10.9	0.218

Additional S-Parameter available on data disc!

Electrical Characteristics (cont)

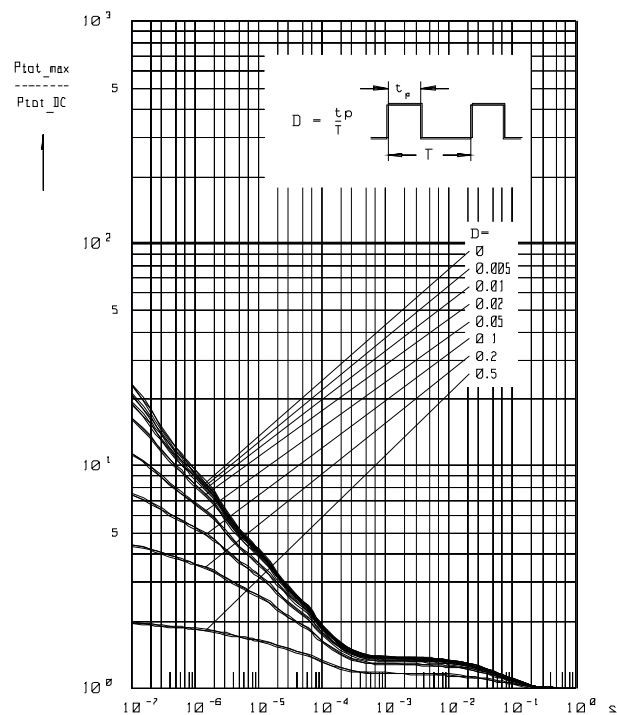
Total Power Dissipation

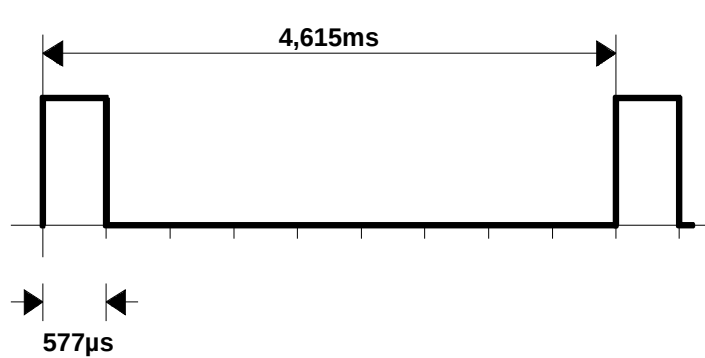
$$P_{tot} = f(T_s)$$



Permissible Pulse Load

$$P_{totmax}/P_{totDC} = f(t_p)$$

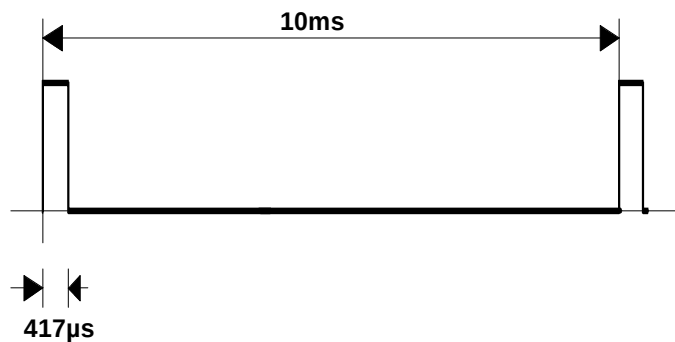


Electrical Characteristics (cont)**Increased Power Handling Capability Pulsed Applications****GSM/PCN TDMA-Frame:**

$$D = \frac{t_p}{T} = \frac{0,577\text{ms}}{4,615\text{ms}} = 0,125$$

Take value $\frac{P_{\text{tot_max}}}{P_{\text{tot_DC}}}$ from diagram permissible pulse load $\rightarrow \frac{P_{\text{tot_max}}}{P_{\text{tot_DC}}} \approx 1,4$

$$P_{\text{tot}} = 2W \times 1,4 = 2,8W$$

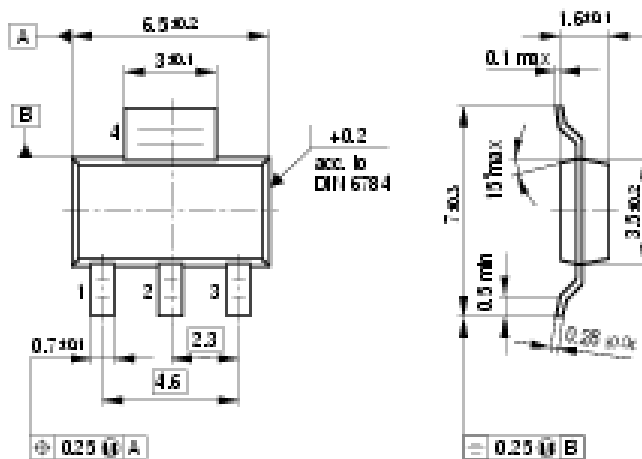
DECT TDMA-Frame:

$$D = \frac{t_p}{T} = \frac{10\text{ms}}{4,615\text{ms}} = 0,0417$$

Take value $\frac{P_{\text{tot_max}}}{P_{\text{tot_DC}}}$ from diagram permissible pulse load $\rightarrow \frac{P_{\text{tot_max}}}{P_{\text{tot_DC}}} \approx 1,5$

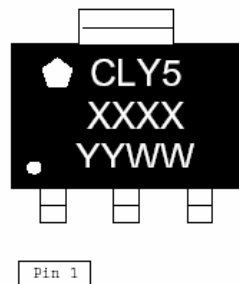
$$P_{\text{tot}} = 2W \times 1,5 = 3W$$

Package Dimensions



Package Marking

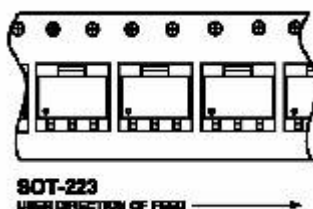
TOP MARK



LASER MARK.

Line 1 = (pentagon shape) + CLY5
Line 2 = XXXX = TriQuint Lot Number
Line 3 = YYWW = year, workweek.

Package Orientation on Reel



Ordering Information

Type	Marking	Pin Configuration				Package 1)
		1	2	3	4	
CLY5	CLY5	G	S	D	S	SOT 223

Additional Information

This part is compliant with RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

The part is rated Moisture Sensitivity Level 3 at 260°C per JEDEC standard IPC/JEDEC J-STD-020.

ESD: **E**lectrostatic **d**ischarge sensitive device. Observe handling Precautions.

For latest specifications, additional product information, worldwide sales and distribution locations, and information about TriQuint:

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