5W High Linearity and High Efficiency GaAs Power FETs

FEATURES

- 5 W Typical Power at 6 GHz
- Linear Power Gain: G_L = 10 dB Typical at 6 GHz
- High Linearity: IP3 = 47 dBm Typical at 6 GHz
- Via Holes Source Ground
- Suitable for High Reliability Application
- Breakdown Voltage: $BV_{DGO} \geq 15$ V
- Lg = 0.35 µm, Wg = 12 mm
- High Power Added Efficiency: PAE ≥ 40 % for Class A Operation
- Tight Vp ranges control
- High RF input power handling capability
- 100 % DC Tested

PHOTO ENLARGEMENT

DESCRIPTION

The TC1801 is a Pseudomorphic High Electron Mobility Transistor (PHEMT) GaAs Power FET, Which has high linearity and high Power Added Efficiency. The device is processed with a propriety via-hole process, which provides low thermal resistance and low inductance. The short gate length enables the device to be used in circuits up to 20 GHz. All devices are 100 % DC tested to assure consistent quality.Bond pads are gold plated for either thermo-compression or thermo-sonic wire bonding. Backside gold plating is compatible with standard AuSn die-attach. Typical applications include commercial and military high performance power amplifier.

ELECTRICAL SPECIFICATIONS (T_A=25 °C)

Symbol	Conditions	MIN	TYP	MAX	UNIT
P_{1dB}	Output Power at 1dB Gain Compression Point, f = 6 GHz V_{DS} = 8 V, I_{DS} = 1200 mA	36	36.5		dBm
G_L	Linear Power Gain, f = 6 GHz V_{DS} = 8 V, I_{DS} = 1200 mA	9	10		dB
IP3	Intercept Point of the 3rd-order Intermodulation, f = 6GHz V_{DS} = 8V, I_{DS} =1200mA,*P_{SCL}=23 dBm		47		dBm
PAE	Power Added Efficiency at 1dB Compression Power, f = 6 GHz		40		%
I_{DSS}	Saturated Drain-Source Current at V_{DS} = 2 V, V_{GS} = 0 V		3		A
g_m	Transconductance at V_{DS} = 2 V, V_{GS} = 0 V		2000		mS
V_P	Pinch-off Voltage at V_{DS} = 2 V, I_D = 24 mA		-1.7**		Volts
BV_{DGO}	Drain-Gate Breakdown Voltage at I_{DGO} = 6 mA	15	18		Volts
R_{th}	Thermal Resistance		2		°C/W

Note:

*** P_{SCL}: Output Power of Single Carrier Level.**

* *For the tight control of the pinch-off voltage . TC1801's are divided into 3 groups:
(1)**TC1801P1519** : Vp = -1.5V to -1.9V (2) **TC1801P1620** : Vp = -1.6V to -2.0V
(3)**TC1801P1721** : Vp = -1.7V to -2.1V In addition, the customers may specify their requirements.

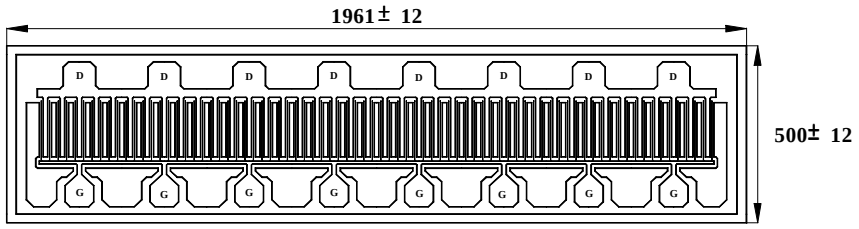
ABSOLUTE MAXIMUM RATINGS (T_A=25 °C)

Symbol	Parameter	Rating
V_{DS}	Drain-Source Voltage	12 V
V_{GS}	Gate-Source Voltage	-5 V
I_D	Drain Current	3 A
P_{in}	Input Power, CW	33 dBm
P_T	Continuous Dissipation	12 W
T_{CH}	Channel Temperature	175 °C
T_{STG}	Storage Temperature	- 65 °C to +175 °C

RECOMMANDED OPERATING CONDITION

Symbol	Parameter	Rating
V_{DS}	Drain to Source Voltage	8 V
I_D	Drain Current	1200 mA

CHIP DIMENSIONS



Units: Micrometers

Chip Thickness: 50

Gate Pad: 76.0 x 59.5

Drain Pad: 86.0 x 76.0

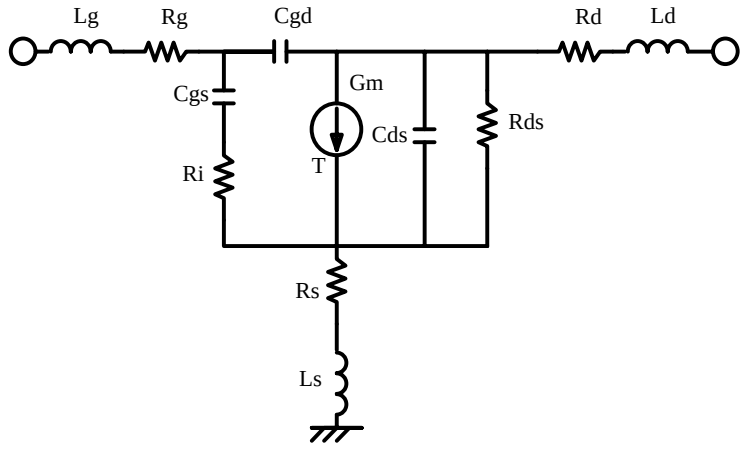
TYPICAL SCATTERING PARAMETERS (V_{DS} = 8 V, I_{DS} = 1200 mA)

FREQUENCY	S11		S21		S12		S22	
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
0.05	0.98718	-74.796	44.709	141.78	0.0093564	51.986	0.53531	-156.17
0.1	0.97588	-113.62	30.626	122.04	0.012818	32.463	0.66842	-162.21
0.2	0.96903	-143.77	17.328	106.44	0.014505	17.281	0.73702	-169.54
0.3	0.96732	-155.38	11.861	100.02	0.014893	11.291	0.75333	-172.55
0.4	0.96668	-161.4	8.9796	96.368	0.015032	8.0598	0.75952	-174.06
0.5	0.96639	-165.06	7.2132	93.875	0.015093	5.9902	0.76261	-174.93
0.6	0.96624	-167.52	6.0227	91.976	0.015122	4.5141	0.76447	-175.46
0.7	0.96616	-169.28	5.1667	90.42	0.015134	3.3813	0.76578	-175.79
0.8	0.96612	-170.6	4.522	89.08	0.015136	2.465	0.76681	-176.01
0.9	0.96611	-171.63	4.0188	87.886	0.015133	1.694	0.76769	-176.14
1	0.96611	-172.45	3.6153	86.794	0.015124	1.0256	0.76851	-176.21
1.1	0.96613	-173.12	3.2844	85.778	0.015112	0.43245	0.76931	-176.24
1.2	0.96615	-173.68	3.0081	84.818	0.015098	-0.10378	0.77009	-176.25
1.3	0.96618	-174.16	2.7739	83.902	0.015081	-0.59563	0.7709	-176.23
1.4	0.96622	-174.56	2.5728	83.022	0.015061	-1.0521	0.77172	-176.19
1.5	0.96626	-174.91	2.3982	82.171	0.01504	-1.4797	0.77257	-176.14
1.6	0.96631	-175.22	2.2452	81.343	0.015017	-1.8835	0.77345	-176.07
1.7	0.96637	-175.49	2.11	80.535	0.014992	-2.267	0.77436	-176
1.8	0.96643	-175.73	1.9895	79.745	0.014965	-2.6332	0.77531	-175.93
1.9	0.96649	-175.94	1.8816	78.969	0.014937	-2.9843	0.77629	-175.84
FREQUENCY	S11		S21		S12		S22	

(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
2	0.96655	-176.13	1.7843	78.207	0.014907	-3.322	0.77731	-175.76
3	0.96737	-177.34	1.1627	71.0939	0.01453	-6.1803	0.78933	-174.84
4	0.9684	-177.93	0.84606	64.626	0.01406	-8.3698	0.80383	-174.04
5	0.96955	-178.3	0.65308	58.678	0.01351	-10.0109	0.81955	-173.45
6	0.97072	-178.55	0.5231	53.214	0.01293	-11.134	0.83537	-173.09
7	0.97187	-178.74	0.42992	48.21	0.01234	-11.757	0.85055	-172.92
8	0.97295	-178.91	0.36029	43.638	0.01177	-11.907	0.86463	-172.89
9	0.97395	-179.05	0.30667	39.465	0.01122	-11.616	0.87739	-172.97
10	0.97485	-179.17	0.26445	35.6569	0.01071	-10.921	0.8888	-173.13
11	0.97565	-179.29	0.23059	32.178	0.01025	-9.8615	0.89889	-173.33
12	0.97636	-179.4	0.20304	28.995	0.00983	-8.4777	0.90778	-173.57
13	0.977	-179.5	0.18034	26.078	0.00946	-6.8106	0.91558	-173.82
14	0.97755	-179.59	0.16142	23.3969	0.00913	-4.9006	0.92242	-174.08
15	0.97804	-179.68	0.14549	20.9289	0.00885	-2.7879	0.92842	-174.34
16	0.97847	-179.77	0.13197	18.651	0.00862	-0.5116	0.9337	-174.59
17	0.97885	-179.85	0.12041	16.545	0.00842	1.891	0.93836	-174.84
18	0.97919	-179.93	0.11042	14.593	0.00827	4.384	0.94247	-175.09

SMALL SIGNAL MODEL, V_{DS} = 8 V, I_{DS} = 1200 mA

SCHEMATI



FET Parameter

Lg = 0.002 nH	**Rs = 0.096 Ohm**
Rg = 0.125 Ohm	**Ls = 0.001 nH**
Cgs = 18.81 pF	**Cds = 2.1 pF**
Ri = 0.203 Ohm	**Rds = 21.25 Ohm**
Cgd = 1.05 pF	**Rd = 0.167 Ohm**
Gm = 2016 mS	**Ld = 0.002 nH**
T = 3.9 psec	