

## 1 W Flange Ceramic Packaged PHEMT GaAs Power FETs

### FEATURES

- 1 W Typical Output Power at 6 GHz
- 12 dB Typical Linear Power Gain at 6 GHz
- High Linearity: IP3 = 40 dBm Typical at 6 GHz
- High Power Added Efficiency:  
Nominal PAE of 43 % at 6 GHz
- Suitable for High Reliability Application
- Breakdown Voltage:  $BV_{DGO} \geq 15$  V
- $L_g = 0.35 \mu\text{m}$ ,  $W_g = 2.4$  mm
- Tight  $V_p$  ranges control
- High RF input power handling capability
- 100 % DC Tested
- Flange Ceramic Package

### PHOTO ENLARGEMENT



### DESCRIPTION

The TC2591 is packaged with the TC1501 Pseudomorphic High Electron Mobility Transistor (PHEMT) chip. The flange ceramic package provides the best thermal conductivity for the GaAs FET. All devices are 100% DC and RF tested to assure consistent quality. Typical applications include high dynamic range power amplifiers for commercial and military high performance power applications.

### ELECTRICAL SPECIFICATIONS ( $T_A=25$ °C)

Symbol	CONDITIONS	MIN	TYP	MAX	UNIT
$P_{1dB}$	Output Power at 1dB Gain Compression Point, $f = 6\text{GHz}$ $V_{DS} = 8$ V, $I_{DS} = 240$ mA	29.5	30		dBm
$G_L$	Linear Power Gain, $f = 6\text{GHz}$ $V_{DS} = 8$ V, $I_{DS} = 240$ mA	11	12		dB
IP3	Intercept Point of the 3 <sup>rd</sup> -order Intermodulation, $f = 6\text{GHz}$ $V_{DS} = 8$ V, $I_{DS} = 240$ mA, $*P_{SCL} = 17$ dBm		40		dBm
PAE	Power Added Efficiency at 1dB Compression Power, $f = 6\text{GHz}$		43		%
$I_{DSS}$	Saturated Drain-Source Current at $V_{DS} = 2$ V, $V_{GS} = 0$ V		600		mA
$g_m$	Transconductance at $V_{DS} = 2$ V, $V_{GS} = 0$ V		400		mS
$V_p$	Pinch-off Voltage at $V_{DS} = 2$ V, $I_D = 4.8$ mA		-1.7**		Volts
$BV_{DGO}$	Drain-Gate Breakdown Voltage at $I_{DGO} = 1.2$ mA	15	18		Volts
$R_{th}$	Thermal Resistance		18		°C/W

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

\*\* For the tight control of the pinch-off voltage range, we divide TC2591 into 3 model numbers to fit customer design requirement  
 (1)TC2591P1519 :  $V_p = -1.5\text{V}$  to  $-1.9\text{V}$  (2)TC2591P1620 :  $V_p = -1.6\text{V}$  to  $-2.0\text{V}$  (3)TC2591P1721 :  $V_p = -1.7\text{V}$  to  $-2.1\text{V}$

If required, customer can specify the requirement in purchasing document. For special  $V_p$  requirement, please contact factory for details.

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub>=25 °C)**

Symbol	Parameter	Rating
V <sub>DS</sub>	Drain-Source Voltage	12 V
V <sub>GS</sub>	Gate-Source Voltage	-5 V
I <sub>DS</sub>	Drain Current	I <sub>DSS</sub>
P <sub>in</sub>	RF Input Power, CW	28 dBm
P <sub>T</sub>	Continuous Dissipation	3.8 W
T <sub>CH</sub>	Channel Temperature	175 °C
T <sub>STG</sub>	Storage Temperature	- 65 °C to +175 °C

**RECOMMENDED OPERATING CONDITION**

Symbol	Parameter	Rating
V <sub>DS</sub>	Drain to Source Voltage	8 V
I <sub>D</sub>	Drain Current	240 mA

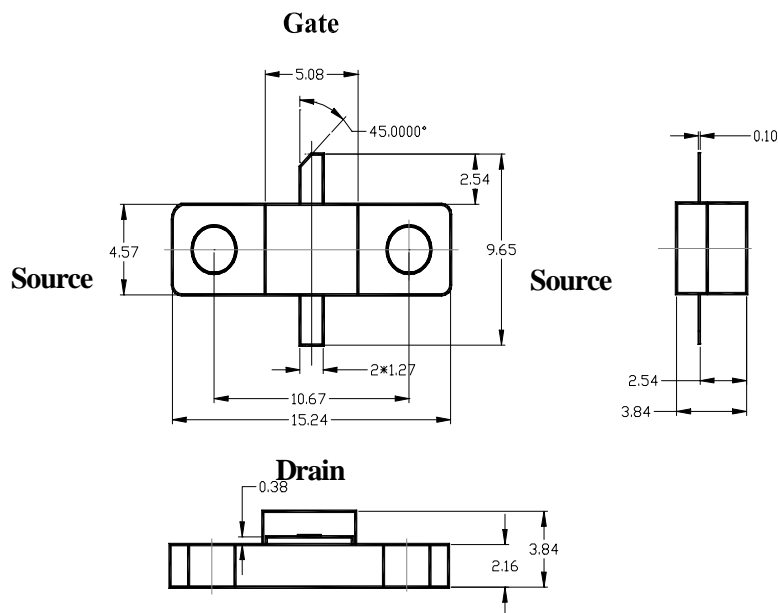
**HANDLING PRECAUTIONS:**

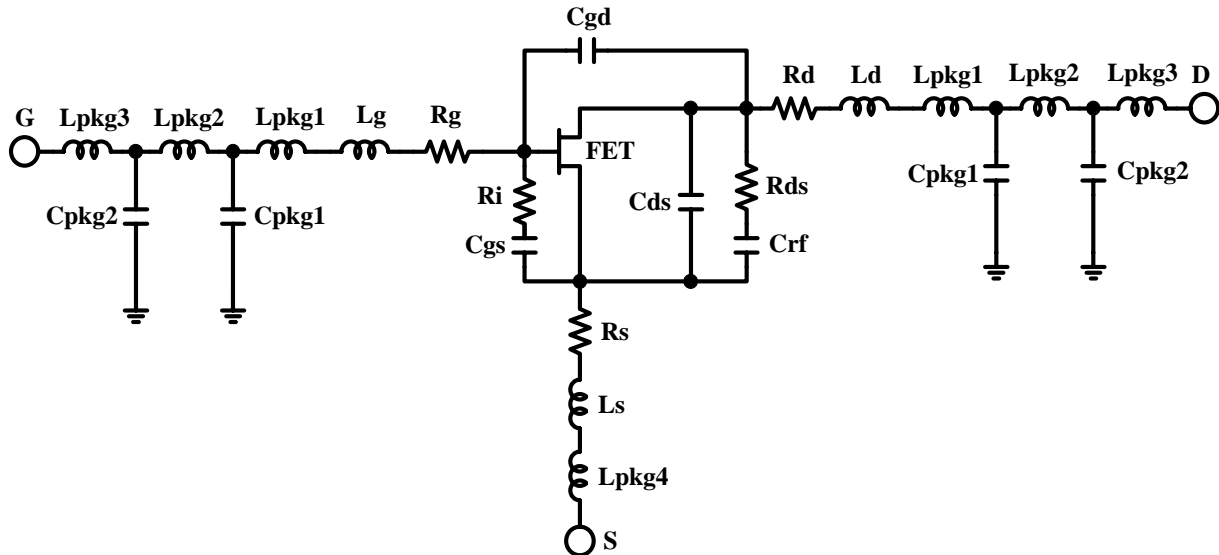
The user must operate in a clean, dry environment. Electrostatic Discharge (ESD) precautions should be observed at all stages of storage, handling, assembly, and testing. The static discharge must be less than 300V.

**TYPICAL SCATTERING PARAMETERS (T<sub>A</sub>=25 °C)**

V<sub>DS</sub> = 8 V, I<sub>DS</sub> = 240 mA

FREQUENCY (GHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
2	0.9111	-167.09	3.8048	68.95	0.0337	-10.27	0.4441	170.74
3	0.8964	166.15	2.8222	42.16	0.0378	-31.72	0.4297	157.73
4	0.8794	141.85	2.3866	16.06	0.0429	-52.55	0.3963	143.48
5	0.8578	114.38	2.1913	-12.25	0.0497	-75.68	0.3453	124.99
6	0.8360	79.47	2.0878	-44.97	0.0575	-103.32	0.2799	96.28
7	0.8306	34.88	1.9288	-83.30	0.0627	-136.68	0.2361	45.65
8	0.8581	-14.11	1.5922	-125.20	0.0600	-173.75	0.3061	-16.20
9	0.9001	-56.65	1.1456	-165.31	0.0493	150.84	0.4635	-58.84

**OUTLINE DIMENSIONS (Unit: mm)**


**NONLINEAR MODEL**

**TOM2 MODEL PARAMETERS**

<b>VTO</b>	-2 V	<b>CGD</b>	0.22 pF
<b>ALPHA</b>	4.54	<b>CGS</b>	4.04 pF
<b>BETA</b>	0.399	<b>CDS</b>	0.62 pF
<b>GAMMA</b>	0.0084	<b>VBR</b>	15 V
<b>DELTA</b>	0.003	<b>TNOM</b>	27 °C
<b>Q</b>	1.055	<b>LS</b>	0.009 nH
<b>NG</b>	0	<b>LG</b>	0.0475 nH
<b>ND</b>	0.01	<b>LD</b>	0.032 nH
<b>TAU</b>	3.9 ps	<b>Rds</b>	10.29 Ohm
<b>RG</b>	0.65 Ohm	<b>Ri</b>	0.0375 Ohm
<b>RD</b>	0.675 Ohm	<b>CrF</b>	1E-7 PF
<b>RS</b>	0.475 Ohm	<b>Lpkg1</b>	0.1 nH
<b>IS</b>	1E-14 mA	<b>Lpkg2</b>	0.16 nH
<b>N</b>	1	<b>Lpkg3</b>	0.07 nH
<b>VBI</b>	0.68 V	<b>Lpkg4</b>	0.032 nH
<b>VDELTA</b>	0.2 V	<b>Cpkg1</b>	0.42 PF
<b>VMAX</b>	0.5 V	<b>Cpkg2</b>	0.26 PF

**MODEL RANGE**

Frequency: 0.5 to 10 GHz

 Bias:  $V_{DS} = 1V$  to  $8V$ ,  $I_D = 100mA$  to  $600mA$ 
 $I_{DS} = 600mA$  at  $V_{GS} = 0V$ ,  $V_{DS} = 2V$