

5 W Flange Ceramic Packaged GaAs Power FETs

FEATURES

- 5 W Typical Power at 2.45 GHz
- 13 dB Typical Linear Power Gain at 2.45 GHz
- High Linearity:
IP3 = 47 dBm Typical at 2.45 GHz
- High Power Added Efficiency:
Nominal PAE of 40 % at 2.45 GHz
- Suitable for High Reliability Application
- $L_g = 0.6 \mu\text{m}$, $W_g = 12 \text{ mm}$
- 100 % DC and RF Tested
- Flange Ceramic Package

PHOTO ENLARGEMENT



DESCRIPTION

The TC2896 is packaged with the TC1806 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 amplifier for commercial applications including Cellular/PCS systems, and military high performance power amplifier.

ELECTRICAL SPECIFICATIONS

Symbol	CONDITIONS	MIN	TYP	MAX	UNIT
P_{1dB}	Output Power at 1dB Gain Compression Point, $f = 2.45\text{GHz}$ $V_{DS} = 8 \text{ V}$, $I_{DS} = 1300 \text{ mA}$	36	36.5		dBm
G_L	Linear Power Gain, $f = 2.45\text{GHz}$ $V_{DS} = 8 \text{ V}$, $I_{DS} = 1300 \text{ mA}$	12	13		dB
IP3	Intercept Point of the 3 rd -order Intermodulation, $f = 2.45\text{GHz}$ $V_{DS} = 8 \text{ V}$, $I_{DS} = 1300 \text{ mA}$, * $P_{SCL} = 23 \text{ dBm}$		47		dBm
PAE	Power Added Efficiency at 1dB Compression Power, $f = 2.45\text{GHz}$		40		%
I_{DSS}	Saturated Drain-Source Current at $V_{DS} = 2 \text{ V}$, $V_{GS} = 0 \text{ V}$		3		A
g_m	Transconductance at $V_{DS} = 2 \text{ V}$, $V_{GS} = 0 \text{ V}$		2000		mS
V_P	Pinch-off Voltage at $V_{DS} = 2 \text{ V}$, $I_D = 24 \text{ mA}$		-1.7**		Volts
BV_{DGO}	Drain-Gate Breakdown Voltage at $I_{DGO} = 6 \text{ mA}$	18	22		Volts
R_{th}	Thermal Resistance		2.7		°C/W

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

** For the tight control of the pinch-off voltage range, we divide TC2896 into 3 model numbers to fit customer design requirement
 (1)TC2896P1519 : $V_p = -1.5\text{V}$ to -1.9V (2)TC2896P1620 : $V_p = -1.6\text{V}$ to -2.0V (3)TC2896P1721 : $V_p = -1.7\text{V}$ to -2.1V
 If required, customer can specify the requirement in purchasing document. For special V_p requirement, please contact factory for details.

ABSOLUTE MAXIMUM RATINGS at 25 °C

Symbol	Parameter	Rating
V _{DS}	Drain-Source Voltage	12 V
V _{GS}	Gate-Source Voltage	-5 V
I _{DS}	Drain Current	I _{DSS}
P _{in}	RF Input Power, CW	27 dBm
P _T	Continuous Dissipation	19 W
T _{CH}	Channel Temperature	175 °C
T _{STG}	Storage Temperature	- 65 °C to +175 °C

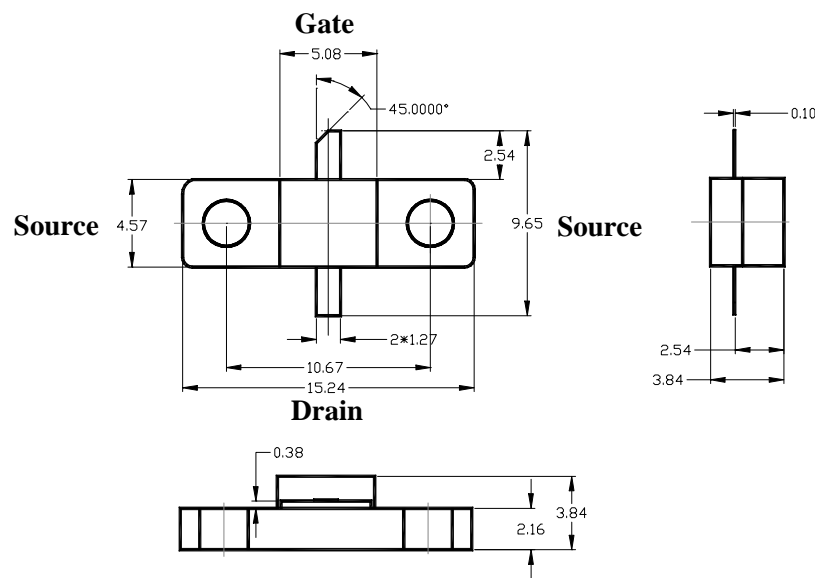
RECOMMENDED OPERATING CONDITION

Symbol	Parameter	Rating
V _{DS}	Drain to Source Voltage	8 V
I _D	Drain Current	1300 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.

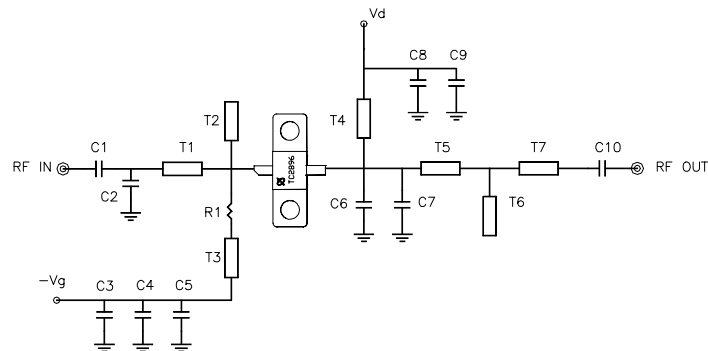
FLANGE PACKAGE OUTLINE (in mm)



TYPICAL COMMON SOURCE SCATTERING PARAMETERS (V_D = 8 V, I_D = 1300 mA)

FREQUENCY (GHz)	S11		S21		S12		S22	
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG
2	0.9650	171.78	0.9104	59.16	0.0139	-12.97	0.8234	170.89
3	0.9638	163.17	0.6050	42.70	0.0142	-21.11	0.8368	165.05
4	0.9619	154.95	0.4575	27.39	0.0149	-28.69	0.8493	158.49
5	0.9589	146.44	0.3761	12.78	0.0159	-36.22	0.8590	151.12
6	0.9546	137.21	0.3298	-1.60	0.0173	-44.15	0.8648	142.84
7	0.9486	126.89	0.3056	-16.23	0.0195	-52.92	0.8664	133.42
8	0.9404	114.98	0.2972	-31.69	0.0224	-63.02	0.8636	122.53
9	0.9295	100.88	0.3011	-48.62	0.0263	-75.03	0.8562	109.67

TEST CIRCUITS

 2.4 GHz 5 W Amplifier Evaluation Board Schematic ($V_D = 8\text{ V}$, $I_D = 1300\text{ mA}$)

EVALUATION BOARD

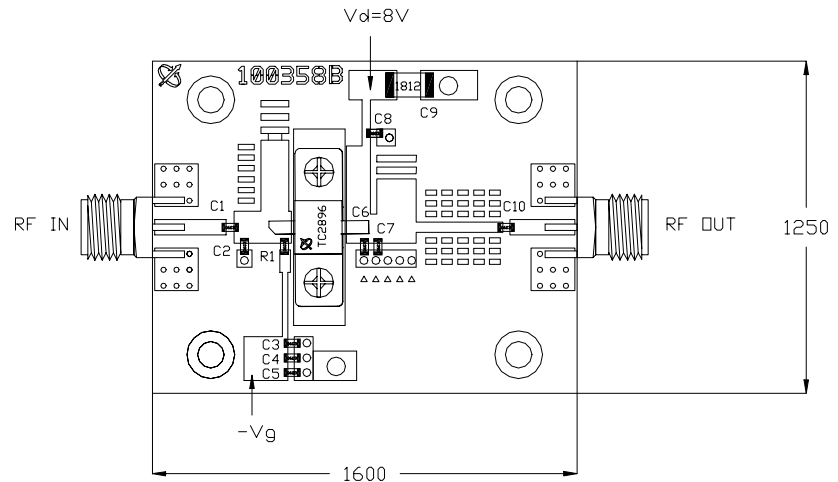
 DXF file of the PCB can be downloaded from our web-site at www.transcominc.com.tw

PCB Material: FR4

 $ER = 4.6$

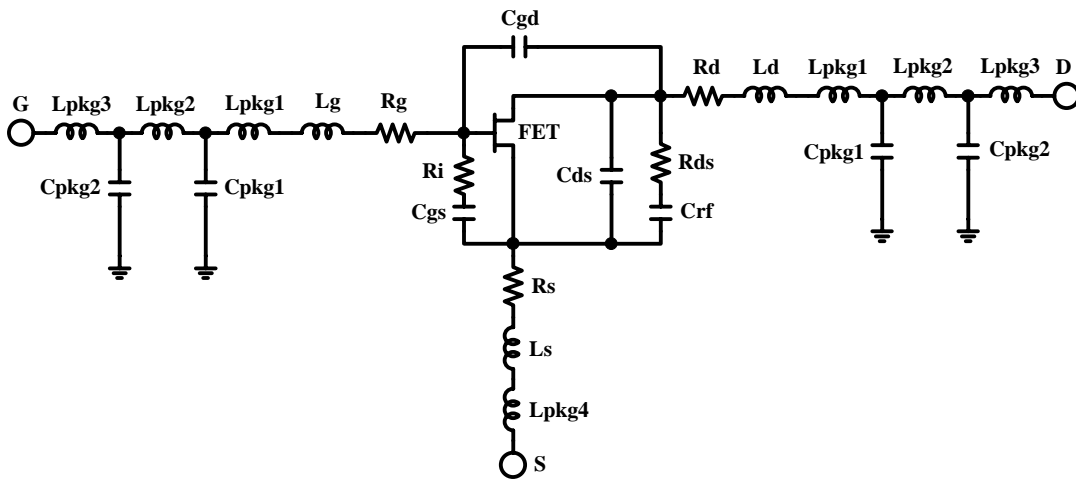
Thickness = 31 mil

Unit: mil


Evaluation Board Parts List

Part Type	Reference Designator	Description
Resistor	R1	12 ohm 0603
Capacitor	C1, C2	0.75 pF 0603
Capacitor	C6	1.5 pF 0603
Capacitor	C7	0.5 pF 0603
Capacitor	C8, C10	50 pF 0603
Capacitor	C9	10 uF 1812
Capacitor	C4	100 pF 0603
Capacitor	C3	1000 pF 0603
Capacitor	C5	0.1 uF 0603

SMALL SIGNAL MODEL ($V_D = 8\text{ V}$, $I_D = 1300\text{ mA}$)



FET Elements

$L_g = 0.0034\text{ nH}$	$R_{ds} = 6.49\text{ Ohm}$
$C_{gd} = 0.763\text{ pF}$	$R_d = 0.193\text{ Ohm}$
$R_g = 0.172\text{ Ohm}$	$L_d = 0.0032\text{ nH}$
$C_{gs} = 28.656\text{ pF}$	$L_{pkg1} = 0.1725\text{ nH}$
$R_i = 0.336\text{ Ohm}$	$L_{pkg2} = 0.208\text{ nH}$
$G_m = 2000\text{ mS}$	$L_{pkg3} = 0.079\text{ nH}$
$T = 7.0\text{ psec}$	$L_{pkg4} = 0.00062\text{ nH}$
$R_s = 0.265\text{ Ohm}$	$C_{pkg1} = 0.408\text{ pF}$
$L_s = 0.00048\text{ nH}$	$C_{pkg2} = 0.263\text{ pF}$
$C_{ds} = 5.01\text{ pF}$	