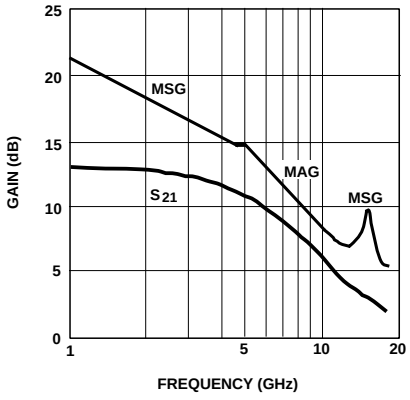
Surface Mount Gallium Arsenide FET for Oscillators

Technical Data

ATF-13786

Features

- **Low Cost Surface Mount Plastic Package**
- **High f_{MAX}:** 60 GHz Typical
- **Low Phase Noise at 10 GHz:** -110 dBc/Hz @ 100 kHz Typical
- **Output Power at 10 GHz:** up to 10 dBm
- **Tape-and-Reel Packaging Option Available**

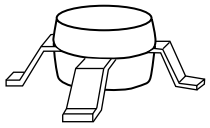


Insertion Power Gain, Maximum Available Gain, and Maximum Stable Gain vs. Frequency.
V_{DS} = 3 V, I_{DS} = 40 mA.

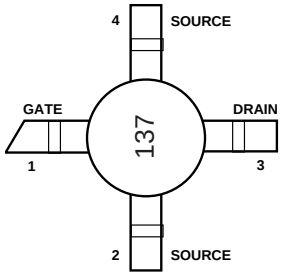
Description

Hewlett-Packard's ATF-13786 is a low cost Gallium Arsenide Schottky barrier-gate field effect transistor housed in a surface mount plastic package. This device is designed for use in low cost, surface mount oscillators operating over the RF and microwave frequency ranges. The ATF-13786 has sufficient gain for easy use as a negative R cell, without excess gain that can lead to unwanted oscillations and mode jumping. The gate structure used in the fabrication of this device results in phase noise performance superior to that of most other MESFETs. These features make this device particularly well suited for low power (< +10 dBm) commercial oscillator applications such as are encountered in DBS, TVRO, and MMDS television receivers, or hand-held transceivers operating in the 900 MHz, 2.4 GHz, and 5.7 GHz ISM bands.

85 mil Plastic Surface Mount Package



Pin Configuration



This GaAs FET device has a nominal 0.3 micron gate length with a total gate periphery of 250 microns. Proven gold based metallization systems and nitride passivation assure a rugged, reliable device.

ATF-13786 Absolute Maximum Ratings

Symbol	Parameter	Units	Absolute Maximum[1]
V_{DS}	Drain-Source Voltage	V	4
V_{GS}	Gate-Source Voltage	V	-4
V_{GD}	Gate-Drain Voltage	V	-6
I_{DS}	Drain Current	mA	I_{DSS}
P_T	Power Dissipation[2,3]	mW	225
T_{CH}	Channel Temperature	°C	150
T_{STG}	Storage Temperature	°C	-65 to +150

Notes:
1. Operation of this device above any one of these conditions may cause permanent damage.
2. T_{CASE} = 25°C (T_{CASE} is defined to be the temperature at the ends of pins 2 and 4 where they contact the circuit board).
3. Derate at 3.1 mW/°C for T_C > 60 °C.

Thermal Resistance[2]:	θ_{jc} = 325°C/W

ATF-13786 Electrical Specifications, T_C = 25°C, V_{DS} = 3 V, I_{DS} = 40 mA[4] (unless noted)

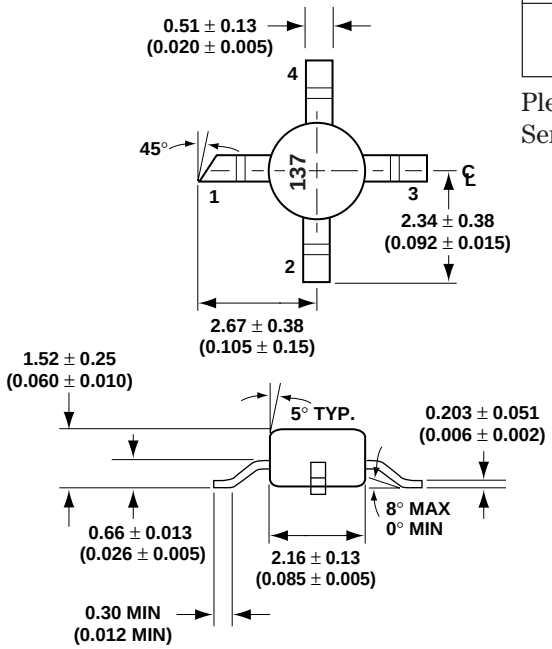
Symbol	Parameters and Test Conditions		Units	Min.	Typ.	Max.
$\|S_{21}\|^2$	Insertion Power Gain	f = 10 GHz	dB		6.0	
$P_{1\ dB}$	Power at 1 dB Gain Compression	f = 10 GHz	dBm	15	16.5	
$G_{1\ dB}$	1 dB Compressed Gain	f = 10 GHz	dB	6.5	7.5	
PN	Phase Noise (100 kHz offset)[5]	f = 10 GHz	dBc/Hz		-110	
g_m	Transconductance	V_{DS} = 3 V, V_{GS} = 0 V	mS	25	55	
I_{DSS}	Saturated Drain Current	V_{DS} = 3 V, V_{GS} = 0 V	mA	50	70	100
V_P	Pinchoff Voltage	V_{DS} = 3 V, I_{DS} = 1 mA	V	-2.0	-1.5	-0.5
V_{BDG}	Gate - Drain Breakdown Voltage	I_{DG} = 0.1 mA	V	6.5	7	

Notes:
4. Recommended maximum bias conditions for use as an oscillator.
5. The superior phase noise of this product results from the use of a gate structure optimized for noise performance. Typical performance of 10 GHz parallel resonated, lightly coupled oscillator using high Q dielectric resonator.

Typical Scattering Parameters, Common Source, $Z_O = 50\Omega$, $V_{DS} = 3$ V, $I_{DS} = 40$ mA

Frequency GHz	S_{11}		S_{21}		S_{12}		S_{22}	
	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.	Mag.	Ang.
1	0.97	-23	4.80	157	0.03	77	0.46	-13
2	0.88	-46	4.60	135	0.06	66	0.42	-25
3	0.78	-68	4.35	117	0.08	58	0.36	-35
4	0.67	-95	4.02	95	0.11	47	0.28	-48
5	0.57	-125	3.61	75	0.12	37	0.19	-65
6	0.52	-157	3.20	57	0.13	28	0.12	-93
7	0.53	176	2.84	41	0.14	21	0.08	-147
8	0.57	160	2.54	31	0.14	18	0.10	171
9	0.60	143	2.27	16	0.14	12	0.15	148
10	0.63	130	2.04	4	0.15	6	0.19	134
11	0.64	117	1.82	-9	0.14	0	0.25	122
12	0.67	107	1.65	-19	0.14	-4	0.30	113
13	0.72	99	1.55	-29	0.14	-8	0.35	109
14	0.76	97	1.47	-35	0.14	-9	0.39	111
15	0.78	90	1.40	-46	0.14	-14	0.41	108
16	0.77	83	1.32	-58	0.14	-20	0.42	104
17	0.74	77	1.26	-68	0.14	-28	0.43	98
18	0.73	69	1.23	-80	0.14	-36	0.42	93

85 mil Plastic Surface Mount Package Dimensions



DIMENSIONS ARE IN MILLIMETERS (INCHES)

Part Number Ordering Information

Part Number	Devices per Reel	Reel Size
ATF-13786-TR1	1000	7"
ATF-13786-STR	10	strip

Please refer to the "Tape-and-Reel Packaging for Surface Mount Semiconductors" data sheet for more detailed information.