DESCRIPTION

The MGFC2400 series GaAs FETs are N-channel Schottky gate devices designed for high frequency, medium and high power applications.

These FETs feature source island via-hole structures and air bridge connection of gates and drains to minimize parasitics and enhance high frequency operation, as well as plated heat sinks to improve thermal disssipation characteristics.
These devices have output power ranging from 250mW (–2407) to 1.6W (–2445) and are well suited for operation through 20 GHz.

MGFC2415 FEATURES

- High output power
  P_{1dB} = 450 mW (TYP) @ 12 GHz
- High power gain
  G_{LP} = 7.5 dB (TYP) @ 12 GHz
- High power added efficiency
  η_{add} = 25% (TYP) @ 12GHz, P_{1dB}

MGF2415A FEATURES

- High output power
  P_{1dB} = 27.5 dBm (TYP) @ 14.5 GHz
- High power gain
  G_{LP} = 7.5 dB (TYP) @ 14.5 GHz
- High power added efficiency
  η_{add} = 29% (TYP) @ 14.5 GHz, P_{1dB}

APPLICATION

- S to Ku band power amplifiers

ABSOLUTE MAXIMUM RATINGS (T_a = 25°C)

Symbol	Parameter	Type	Ratings	Unit
V_{GSO}	Gate to source voltage		–15	V
V_{GDO}	Gate to drain voltage		–15	V
I_D	Drain current	MGFC2415	250	mA
		MGF2415A	200	
I_{GR}	Reverse gate current		–0.6	mA
I_{GF}	Forward gate current		2.5	mA
P_T	Total power dissipation		1.5	W
T_{ch}	Channel temperature		175	°C
T_{stg}	Storage temperature	MGFC2415	–55 ~ + 175	°C
		MGF2415A	–65 ~ + 175	
R_{th}	Thermal resistance	MGFC2415	60	°C/W
		MGF2415A	100	

ELECTRICAL CHARACTERISTICS (P_{OUT} = 350mW) (T_a = 25°C)

SYMBOL	PARAMETER	CONDITIONS	TYPE	LIMITS			UNIT
				MIN	TYP	MAX	
I_{DSS}	Saturated drain current	V_{DS} = 3V, V_{GS} = 0V	MGFC2415	280	350	420	mA
			MGF2415A	200	300	400	
$V_{GS(off)}$	Gate to source cut-off voltage	V_{DS} = 3V, I_D = 1mA	MGFC2415	–2	–3	–5	V
			MGF2415A	–1	–2.5	–4	
g_m	Transconductance	V_{DS} = 3V, I_D = 170mA	MGFC2415	100	150		mS
		V_{DS} = 3V, I_D = 150mA	MGF2415A	100	130		
P_{1dB}	Output power at 1 dB gain compression	V_{DS} = 10V, I_D = 0.5 I_{DSS}, f = 12 GHz	MGFC2415	350	450		mW
		V_{DS} = 10V, I_D = 0.5 I_{DSS}, f = 14.5 GHz, R_g = 110Ω	MGF2415A	26.0	27.5		dBm
G_{LP}	Linear power gain	V_{DS} = 10V, I_D = 0.5 I_{DSS}, f = 12 GHz	MGFC2415	6.5	7.5		dB
		V_{DS} = 10V, I_D = 0.5 I_{DSS}, f = 14.5 GHz, R_g = 110Ω	MGF2415A	6.5	7.5		dB
η_{add}	Power added efficiency at P_{1dB}	V_{DS} = 10V, I_D = 0.5 I_{DSS}, f = 12 GHz	MGFC2415		25		%
		V_{DS} = 10V, I_D = 0.5 I_{DSS}, f = 14.5 GHz, R_g = 110Ω	MGF2415A		29		%

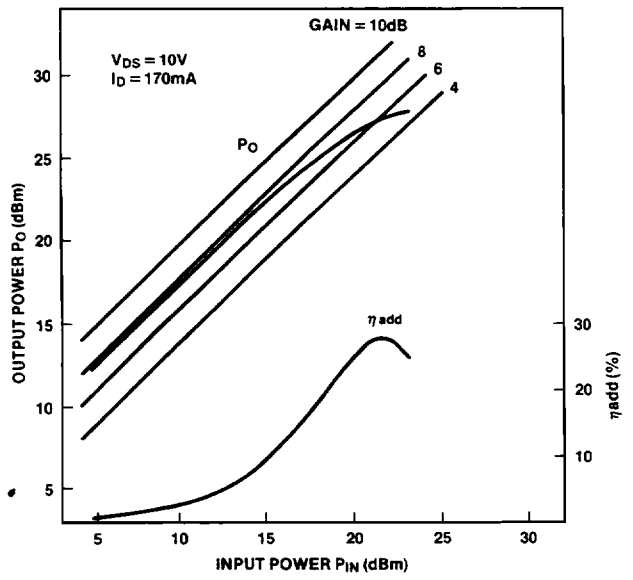
ELECTRICAL CHARACTERISTICS (P_{OUT} = 316mW) (T_a = 25°C)

SYMBOL	PARAMETER	CONDITIONS	TYPE	LIMITS			UNIT
				MIN	TYP	MAX	
I_{DSS}	Saturated drain current	V_{DS} = 3V, V_{GS} = 0V	MGF2415A	—	300	600	mA
$V_{GS(off)}$	Gate to source cut-off voltage	V_{DS} = 3V, I_D = 1mA	MGF2415A	—	2.5	–5.0	V
g_m	Transconductance	V_{DS} = 3V, I_D = 150mA	MGF2415A	—	130	—	mS
P_{1dB}	Output power at 1 dB gain compression	V_{DS} = 10V, I_D = 150mA, f = 14.5 GHz, R_g = 110Ω	MGF2415A	25.0	27.5	—	dBm
G_{LP}	Linear power gain	V_{DS} = 10V, I_D = 150mA, f = 14.5 GHz, R_g = 110Ω	MGF2415A	4.5	6.5	—	dB
η_{add}	Power added efficiency at P_{1dB}	V_{DS} = 10V, I_D = 150mA, f = 14.5 GHz, R_g = 110Ω	MGF2415A	—	25	—	%

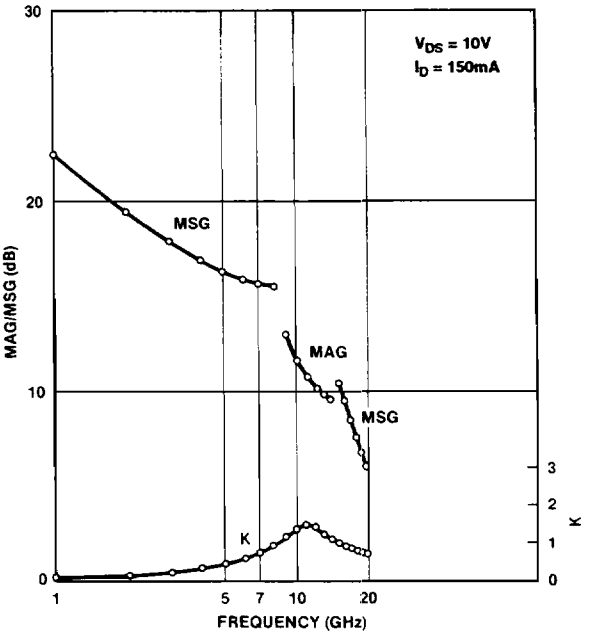
TYPICAL CHARACTERISTICS ($T_a = 25°C$)

MGFC2415

P_O, η_{add} vs. P_{IN} (f = 12GHz)

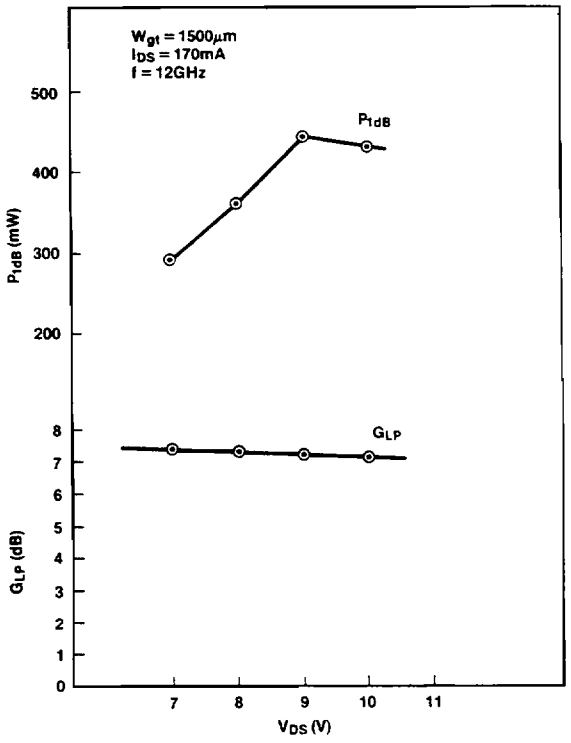


VIA HOLE CHIP Wgt = 1500μm

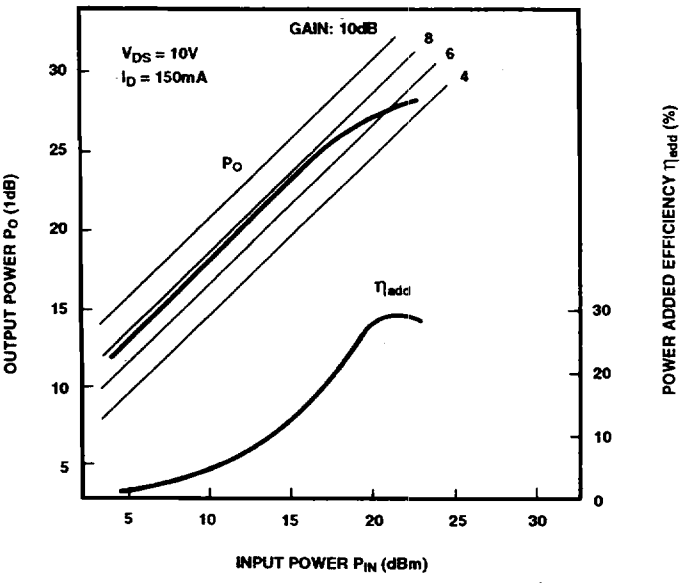


MGF2415A

P_{1dB}, G_{LP} vs. V_{DS}



P_O, η_{add} vs. P_{IN} (f = 14.5GHz)



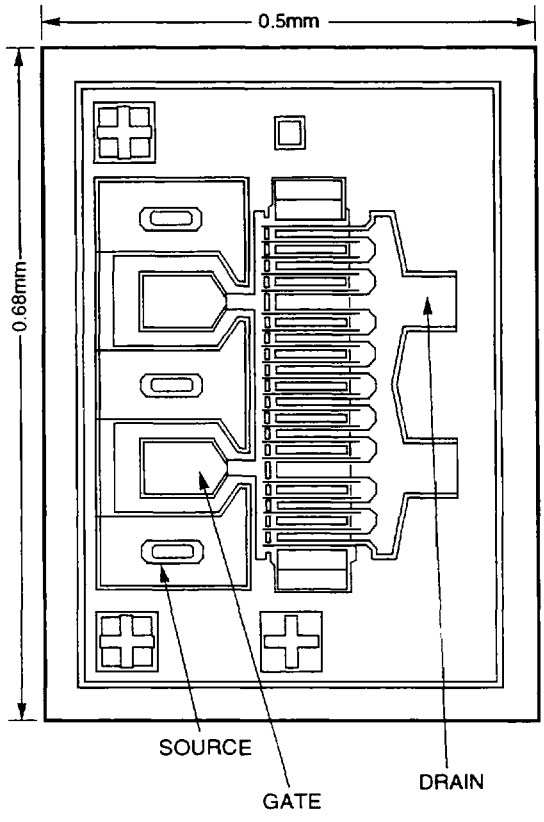
MGFC2415 VIA-HOLE CHIP S PARAMATERS (V_{DS} = 10V, I_{DS} = 150mA)

FREQUENCY (GHz)	S_{11}		S_{21}		S_{12}		S_{22}		K	MAXIMUM GAIN	
	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.	MAG.	ANG.		AVAILABLE	STABLE
1	0.974	−70	6.258	133	0.035	47	0.479	−35	0.082		22.49
2	0.947	−110	4.366	103	0.048	20	0.397	−60	0.166		19.57
3	0.935	−130	3.182	82	0.051	3	0.352	−85	0.257		17.97
4	0.931	−142	2.441	66	0.049	−10	0.338	−111	0.356		16.95
5	0.929	−150	1.937	51	0.046	−20	0.353	−139	0.470		16.29
6	0.931	−155	1.566	37	0.040	−28	0.395	−165	0.605		15.87
7	0.934	−159	1.279	25	0.035	−33	0.455	172	0.769		15.66
8	0.938	−162	1.051	13	0.029	−35	0.523	153	0.967		15.58
9	0.943	−165	0.866	3	0.024	−33	0.589	137	1.191	12.91	
10	0.948	−167	0.718	−6	0.021	−26	0.649	124	1.393	11.67	
11	0.952	−170	0.598	−15	0.019	−15	0.700	112	1.479	10.81	
12	0.956	−171	0.502	−22	0.020	−5	0.743	103	1.415	10.18	
13	0.959	−173	0.425	−28	0.022	3	0.779	95	1.269	9.76	
14	0.961	−175	0.364	−33	0.025	7	0.807	87	1.118	9.61	
15	0.963	−176	0.315	−38	0.028	9	0.830	81	0.992		10.56
16	0.964	−178	0.275	−42	0.031	10	0.849	76	0.896		9.50
17	0.964	−179	0.243	−45	0.034	9	0.864	71	0.825		8.53
18	0.964	180	0.217	−48	0.037	8	0.876	67	0.776		7.65
19	0.963	178	0.196	−50	0.041	6	0.886	64	0.744		6.84
20	0.962	177	0.180	−52	0.044	4	0.893	59	0.725		6.09

MGF2415A S PARAMATERS (V_{DS} = 10V, I_D = 150mA)

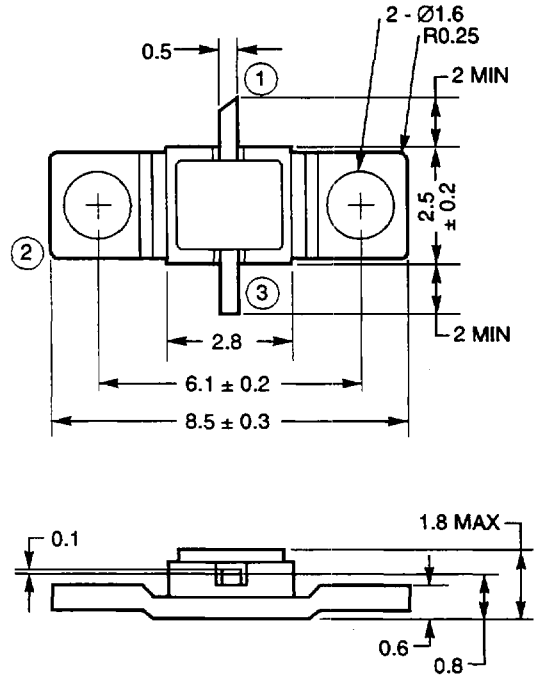
f (GHz)	S Parameters (TYP.)								K	MSG/MAG
	S_{11}		S_{12}		S_{21}		S_{22}			
	Magn.	Angle (deg.)	Magn.	Angle (deg.)	Magn.	Angle (deg.)	Magn.	Angle (deg.)	—	dB
4	0.930	−132.0	0.028	10.0	1.656	62.0	0.564	− 93.5	0.774	17.7
6	0.904	−156.0	0.034	2.0	1.250	42.5	0.654	−108.0	0.884	15.7
8	0.847	−177.0	0.040	− 6.0	1.067	22.5	0.699	−128.5	1.248	11.3
10	0.804	162.0	0.045	−14.0	1.010	− 8.5	0.704	−149.5	1.521	9.3
12	0.709	141.0	0.052	−22.0	0.968	− 30.0	0.721	−173.0	1.917	7.2
14	0.530	109.5	0.069	−41.0	0.869	− 78.0	0.772	163.5	2.106	5.0
16	0.083	21.0	0.113	−77.0	0.779	−130.0	0.889	139.5	1.154	6.0

MGFC2415 CHIP CONFIGURATION



Lg = 0.6 µm
Wgu = 75 µm
Wgt = 1.5mm

MGF2415A OUTLINE DRAWING



UNITS: mm (inches)

1 GATE
2 SOURCE
3 DRAIN

ORDERING INFORMATION

Part Number	Grade	Tested at	P_{1dB} (mW)	Notes
MGFC2415-T02	B	12 GHz, sample	350	
MGFC2415-T03	C	12 GHz, sample	350	
MGF2415A-11	Industrial	14.5 GHz, 100% RF	350	
MGF2415A-02	Industrial	14.5 GHz, 100% RF	316	