CLF1G0035-100P; CLF1G0035S-100P

Broadband RF power GaN HEMT

Rev. 1 — 10 December 2012 Objective data sheet

1. Product profile

1.1 General description

The CLF1G0035-100P and CLF1G0035S-100P are 100 W general purpose broadband GaN HEMTs usable from DC to 3.5 GHz.

Table 1. CW and pulsed RF application information

Typical RF performance at T_{case} = 25 °C; I_{Dq} = 330 mA; V_{DS} = 50 V in a class-AB broadband demo board.

Test signal	f (MHz)	P_L (W)	G_p (dB)	η_D (%)
1-Tone CW	2500	100	12.8	51
	2600	100	12.7	52.4
	2700	100	12.3	50
	2800	100	11.7	49
	2900	100	11.5	49
	3000	100	10.5	47
1-Tone pulsed [1]	2500	100	14.2	52
	2600	100	14.4	54.4
	2700	100	14.1	52.5
	2800	100	13.7	51.5
	2900	100	13.6	51.8
	3000	100	12.7	50.1

[1] Pulsed RF; t_p = 100 µs; δ = 10 %.

Table 2. 2-Tone CW application information

Typical 2-Tone performance at T_{case} = 25 °C; I_{Dq} = 330 mA; V_{DS} = 50 V in a class-AB broadband demo board.

Test signal	f (MHz)	$P_{L(PEP)}$ (W)	IMD3 (dBc)
2-Tone CW [1]	2500	20	–41.6
	2600	20	–43
	2700	20	–41.5
	2800	20	–41.3
	2900	20	–41.3
	3000	20	–40

[1] 2-Tone CW; Δf = 100 kHz.

1.2 Features and benefits

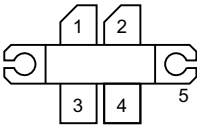
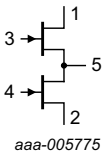
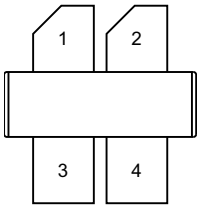
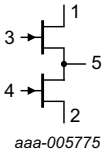
- Frequency of operation is from DC to 3.5 GHz
- 100 W general purpose broadband RF Power GaN HEMT
- Excellent ruggedness (VSWR = 10 : 1)
- High voltage operation (50 V)
- Thermally enhanced package

1.3 Applications

- Commercial wireless infrastructure (cellular, WiMAX)
- Radar
- Broadband general purpose amplifier
- Public mobile radios
- Industrial, scientific, medical
- Jammers
- EMC testing
- Defense application

2. Pinning information

Table 3. Pinning

Pin	Description		Simplified outline	Graphic symbol
CLF1G0035-100P (SOT1228A)				
1	drain1			
2	drain2			
3	gate1			
4	gate2			
5	source	[1]		
CLF1G0035S-100P (SOT1228B)				
1	drain1			
2	drain2			
3	gate1			
4	gate2			
5	source	[1]		

[1] Connected to flange.

3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
CLF1G0035-100P	-	flanged ceramic package; 2 mounting holes; 4 leads	SOT1228A
CLF1G0035S-100P	-	earless flanged ceramic package; 4 leads	SOT1228B

4. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DS}	drain-source voltage		-	150	V
V_{GS}	gate-source voltage		–8	+3	V
I_{GF}	forward gate current	external R_G = 5 Ω	-	36	mA
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature	measured via IR scan	-	250	°C

5. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Typ	Unit
$R_{th(j-c)}$	thermal resistance from junction to case	T_j = 200 °C	[1]	<tbd>	K/W

[1] T_j is measured via IR scan with case temperature of 85 °C and power dissipation of <tbd> W.

6. Characteristics

Table 7. DC characteristics

T_{case} = 25 °C; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)DSS}$	drain-source breakdown voltage	V_{GS} = –7 V; I_{DS} = <tbd> mA	150	-	-	V
$V_{GS(th)}$	gate-source threshold voltage	V_{DS} = 0.1 V; I_{DS} = <tbd> mA	<tbd>	<tbd>	<tbd>	V
I_{DSX}	drain cut-off current	V_{DS} = 10 V; V_{GS} = 3 V	-	<tbd>	-	A
g_{fs}	forward transconductance	V_{DS} = 10 V; V_{GS} = 0 V	-	<tbd>	-	S

Table 8. RF characteristics

Test signal: pulsed RF; t_p = 100 µs; δ = 10 %; RF performance at V_{DS} = 50 V; I_{Dq} = 330 mA; T_{case} = 25 °C; unless otherwise specified in a class-AB production circuit.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
f	frequency		2.5	-	3.0	GHz
η_D	drain efficiency	P_L = 100 W	<tbd>	50	-	%
G_p	power gain	P_L = 100 W	<tbd>	14	-	dB
RL_{in}	input return loss	P_L = 100 W	-	–6	<tbd>	dB
$P_{droop(pulse)}$	pulse droop power	P_L = 100 W	-	<tbd>	-	dB
t_r	rise time	P_L = 100 W	-	<tbd>	-	ns
t_f	fall time	P_L = 100 W	-	<tbd>	-	ns

7. Application information

Table 9. CW and pulsed RF application information

Typical RF performance at T_{case} = 25 °C; I_{Dq} = 330 mA; V_{DS} = 50 V in a class-AB broadband demo board.

Test signal	f (MHz)	P_L (W)	G_p (dB)	η_D (%)
1-Tone CW	2500	100	12.8	51
	2600	100	12.7	52.4
	2700	100	12.3	50
	2800	100	11.7	49
	2900	100	11.5	49
	3000	100	10.5	47
1-Tone pulsed [1]	2500	100	14.2	52
	2600	100	14.4	54.4
	2700	100	14.1	52.5
	2800	100	13.7	51.5
	2900	100	13.6	51.8
	3000	100	12.7	50.1

[1] Pulsed RF; t_p = 100 µs; δ = 10 %.

Table 10. 2-Tone CW application information

Typical 2-Tone performance at T_{case} = 25 °C; I_{Dq} = 330 mA; V_{DS} = 50 V in a class-AB broadband demo board.

Test signal	f (MHz)	$P_{L(PEP)}$ (W)	IMD3 (dBc)
2-Tone CW [1]	2500	20	–41.6
	2600	20	–43
	2700	20	–41.5
	2800	20	–41.3
	2900	20	–41.3
	3000	20	–40

[1] 2-Tone CW; Δf = 100 kHz.

7.1 Ruggedness in class-AB operation

The CLF1G0035-100P and CLF1G0035S-100P are capable of withstanding a load mismatch corresponding to VSWR = 10 : 1 through all phases under the following conditions: V_{DS} = 50 V; P_L = 100 W (pulsed RF), f = 2500 MHz.

7.2 Load pull impedance information

The measured half section load pull impedances are shown below. Impedance reference plane defined at device leads at each half section. Measurements performed with NXP test fixtures. Test temperature set at 25 °C with a pulsed CW signal; t_p = 100 µs; δ = 10 %; RF performance at V_{DS} = 50 V; I_{Dq} = 150 mA.

Table 11. Typical impedance

Typical values unless otherwise specified.

f	Z_S	Z_L (maximum $P_{L(M)}$)	Z_L (maximum η_D)
MHz	Ω	Ω	Ω
500	6.4 + 4j	9.7 + 7j	10 + 5j
1000	1.9 + 2.2j	9.1 + 12.4j	10 + 6j
2000	1.9 – 2.9j	5 + 4.1j	6.6 + 1.4j
2500	2.1 – 6.3j	3.6 + 0.75j	4.5 – 0.4j
3000	2.5 – 9j	3.9 – 1.2j	5.8 – 1.8j
3500	2.9 – 14j	6.6 – 2j	5.8 – 3j

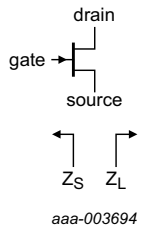


Fig 1. Definition of transistor impedance

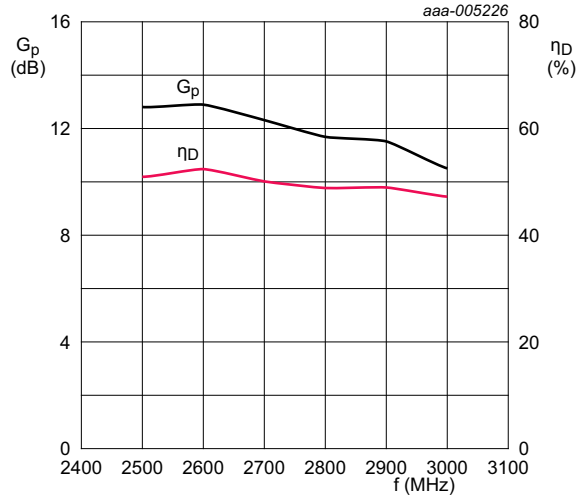
Z_S is the measured source pull impedance presented to the device. Z_L is the measured load pull impedance presented to the device.

8. Test information

8.1 Graphical data

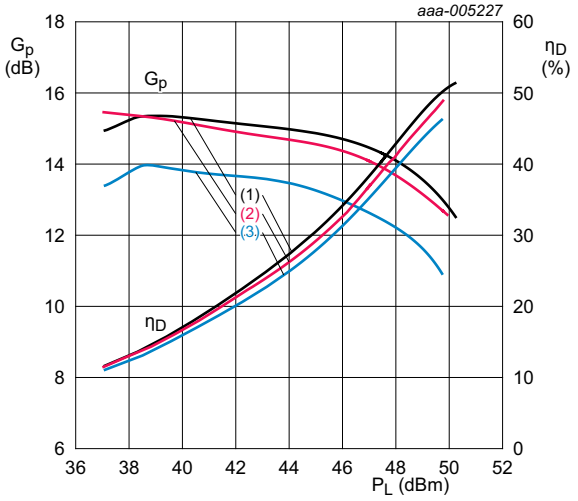
The following figures are measured in a broadband amplifier demo board from 2500 MHz to 3000 MHz.

8.1.1 1-Tone CW RF performance



V_{DS} = 50 V; I_{Dq} = 330 mA; P_L = 100 W.

Fig 2. Power gain and drain efficiency as function of frequency; typical values



V_{DS} = 50 V; I_{Dq} = 330 mA.

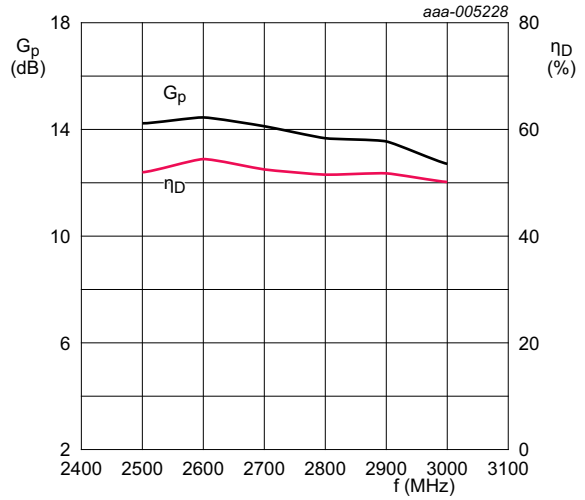
(1) f = 2500 MHz

(2) f = 2700 MHz

(3) f = 3000 MHz

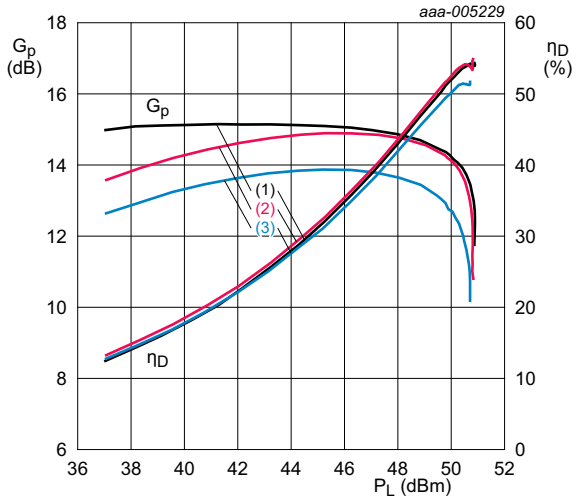
Fig 3. Power gain and drain efficiency as a function of output power; typical values

8.1.2 1-Tone pulsed RF performance



V_{DS} = 50 V; I_{Dq} = 330 mA; P_L = 100 W.

Fig 4. Power gain and drain efficiency as function of frequency; typical values



V_{DS} = 50 V; I_{Dq} = 330 mA.

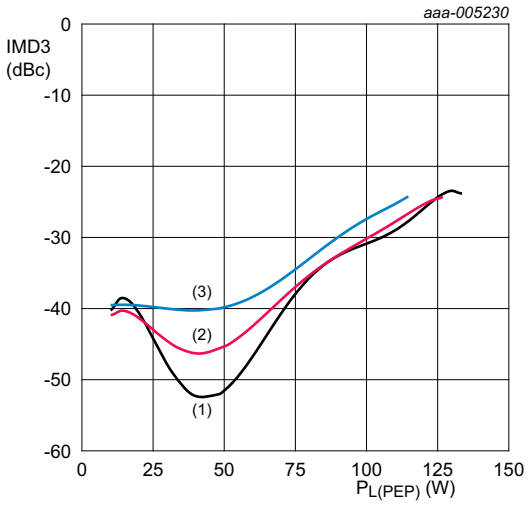
(1) f = 2500 MHz

(2) f = 2700 MHz

(3) f = 3000 MHz

Fig 5. Power gain and drain efficiency as function of output power; typical values

8.1.3 2-Tone CW performance



Δf = 100 kHz; V_{DS} = 50 V; I_{Dq} = 330 mA.

(1) f = 2500 MHz

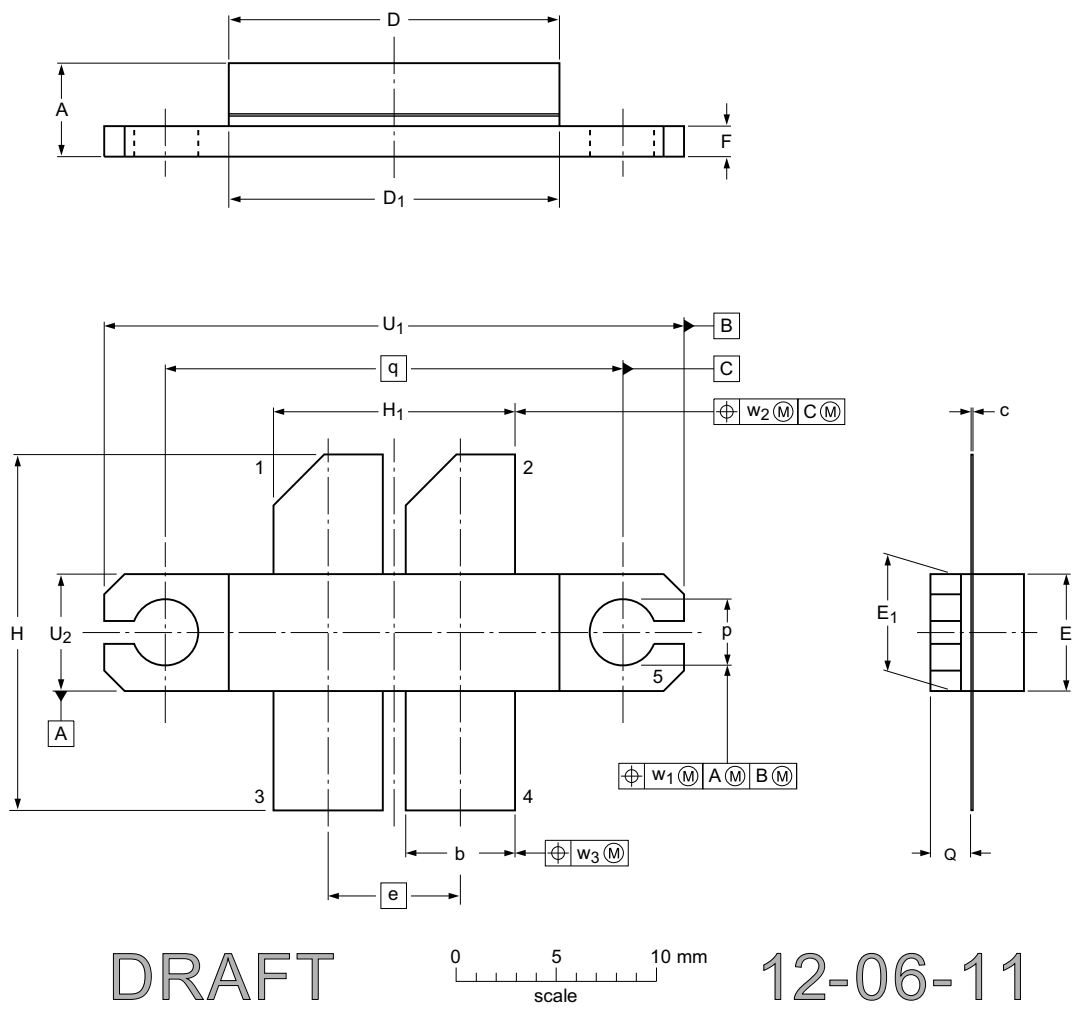
(2) f = 2700 MHz

(3) f = 3000 MHz

Fig 6. Third-order intermodulation distortion as a function of peak envelope power load power; typical values

9. Package outline

Flanged ceramic package; 2 mounting holes; 4 leads **SOT1228A**



Dimensions

Unit[1]		A	b	c	D	D_1	e	E	E_1	F	H	H_1	p	Q[2]	q	U_1	U_2	w_1	w_2	w_3
mm	max	5.03	5.59	0.15	16.66	16.69		5.92	5.97	1.65	18.29	12.19	3.43	2.21		29.08	5.97			
	nom						6.60								22.86			0.25	0.51	0.25
	min	4.45	5.33	0.08	16.36	16.33		5.77	5.72	1.40	17.27	11.94	3.18	1.96		28.83	5.72			
inches	max	0.198	0.220	0.006	0.656	0.657		0.233	0.235	0.065	0.720	0.480	0.135	0.087		1.145	0.235			
	nom						0.26								0.900			0.01	0.02	0.01
	min	0.175	0.210	0.003	0.644	0.643		0.227	0.225	0.055	0.680	0.470	0.125	0.077		1.135	0.225			

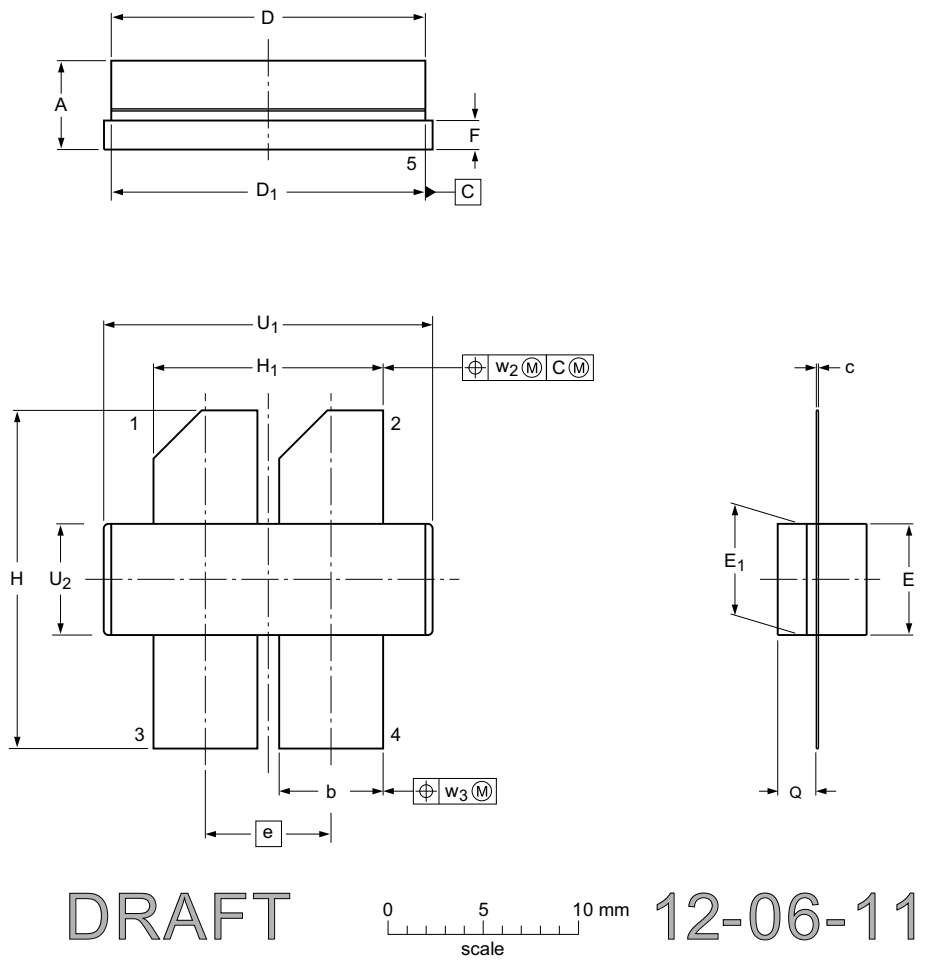
Note
1. Millimeter dimensions are derived from the original inch dimensions.
2. Dimensions is measured 0.030 inch (0.76 mm) from body.

sot1228a_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1228A						~~12-06-07~~ 12-06-11

Fig 7. Package outline SOT1228A

Earless flanged ceramic package; 4 leads **SOT1228B**



Dimensions

Unit[1]		A	b	c	D	D_1	e	E	E_1	F	H	H_1	$Q^{(2)}$	U_1	U_2	w_2	w_3
mm	max	5.03	5.59	0.15	16.66	16.69		5.92	5.97	1.65	18.29	12.19	2.21	17.40	5.97		
	nom						6.60									0.51	0.25
	min	4.45	5.33	0.08	16.36	16.33		5.77	5.72	1.40	17.27	11.94	1.96	17.15	5.72		
inches	max	0.198	0.220	0.006	0.656	0.657		0.233	0.235	0.065	0.720	0.480	0.087	0.685	0.235		
	nom						0.26									0.02	0.01
	min	0.175	0.210	0.003	0.644	0.643		0.227	0.225	0.055	0.680	0.470	0.077	0.675	0.225		

Note
1. Millimeter dimensions are derived from the original inch dimensions.
2. Dimensions is measured 0.030 inch (0.76 mm) from body.

sot1228b_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1228B						~~12-06-07~~ 12-06-11

Fig 8. Package outline SOT1228B

10. Handling information

10.1 ESD Sensitivity

Table 12. ESD sensitivity

ESD model	Class
Human Body Model (HBM); According JEDEC standard JESD22-A114F	1B [1]

[1] Classification 1B is granted to any part that passes after exposure to an ESD pulse of 500 V, but fails after exposure to an ESD pulse of 1000 V.

11. Abbreviations

Table 13. Abbreviations

Acronym	Description
CW	Continuous Wave
EMC	ElectroMagnetic Compatibility
ESD	ElectroStatic Discharge
GaN	Gallium Nitride
HEMT	High Electron Mobility Transistor
VSWR	Voltage Standing-Wave Ratio
WiMAX	Worldwide Interoperability for Microwave Access

12. Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
CLF1G0035-100P_1G0035S-100P v.1	20121210	Objective data sheet	-	-

13. Legal information

13.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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15. Contents

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