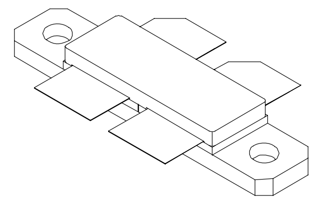
RF power transistor, the LdmoST family

Features

- Excellent thermal stability
- Common source configuration Push-pull
- P_{OUT} = 100 W with 14 dB gain @ 860 MHz
- BeO-free package

Description

The SD56120 is a common source N-Channel enhancement-mode lateral Field-Effect RF power transistor designed for broadband commercial and industrial applications at frequencies up to 1.0 GHz. The SD56120 is designed for high gain and broadband performance operating in common source mode at 28 V. It is ideal for broadcast applications from 470 to 860 MHz requiring high linearity.



M246
Epoxy sealed

Figure 1. Pin connections

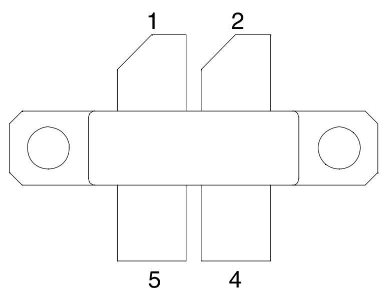


Table 1. Device summary

Order code	Package	Branding
SD56120	M246	SD56120

Contents

1 Electrical data

1.1 Maximum ratings

Table 2. Absolute maximum ratings (T_{CASE} = 25 °C)

Symbol	Parameter	Value	Unit
$V_{(BR)DSS}$	Drain-source voltage	65	V
V_{GS}	Gate-source voltage	±20	V
I_D	Drain current	14	A
P_{DISS}	Power dissipation (@ Tc = 70 °C)	217	W
T_J	Max. operating junction temperature	200	°C
T_{STG}	Storage temperature	-65 to +150	°C

1.2 Thermal data

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Junction - case thermal resistance	0.6	°C/W

2 Electrical characteristics

T_{CASE} = +25 °C

2.1 Static

Table 4. Static (per section)

Symbol	Test conditions			Min	Typ	Max	Unit
$V_{(BR)DSS}$	V_{GS} = 0 V	I_{DS} = 1 mA		65			V
I_{DSS}	V_{GS} = 0 V	V_{DS} = 28 V				1	µA
I_{GSS}	V_{GS} = 20 V	V_{DS} = 0 V				1	µA
$V_{GS(Q)}$	V_{DS} = 28 V	I_D = 200 mA		3.0		5.0	V
$V_{DS(ON)}$	V_{GS} = 10 V	I_D = 3 A			0.7	0.8	V
G_{FS}	V_{DS} = 10 V	I_D = 3 A			3		mho
C_{ISS}	V_{GS} = 0 V	V_{DS} = 28 V	f = 1 MHz		82		pF
C_{OSS}	V_{GS} = 0 V	V_{DS} = 28 V	f = 1 MHz		48		pF
C_{RSS}	V_{GS} = 0 V	V_{DS} = 28 V	f = 1 MHz		2.8		pF

Note: REF. 7194566A

2.2 Dynamic

Table 5. Dynamic

Symbol	Test conditions	Min	Typ	Max	Unit
P_{OUT}	V_{DD} = 28 V I_{DQ} = 400 mA f = 860 MHz	100		-	W
G_{PS}	V_{DD} = 28 V I_{DQ} = 400 mA P_{OUT} = 100 W f = 860 MHz	14	16		dB
η_D	V_{DD} = 28 V I_{DQ} = 400 mA P_{OUT} = 100 W f = 860 MHz	50	60		%
IMD (1)	V_{DD} = 28 V I_{DQ} = 400 mA P_{OUT} = 100 W PEP		-28		dB_C
Load mismatch	V_{DD} = 28 V I_{DQ} = 400 mA P_{OUT} = 100 W f = 860 MHz All phase angles	5:1			VSWR
Input overdrive (2)	V_{DD} = 28 V I_{DQ} = 400 mA P_{IN} = 10 W f = 860 MHz	Must survive			

Note: 1 PEP f1 = 860 MHz f2 = 860.1 MHz

2 Overdrive test done at wafer sampling only.

3 Impedances

Figure 2. Current conventions

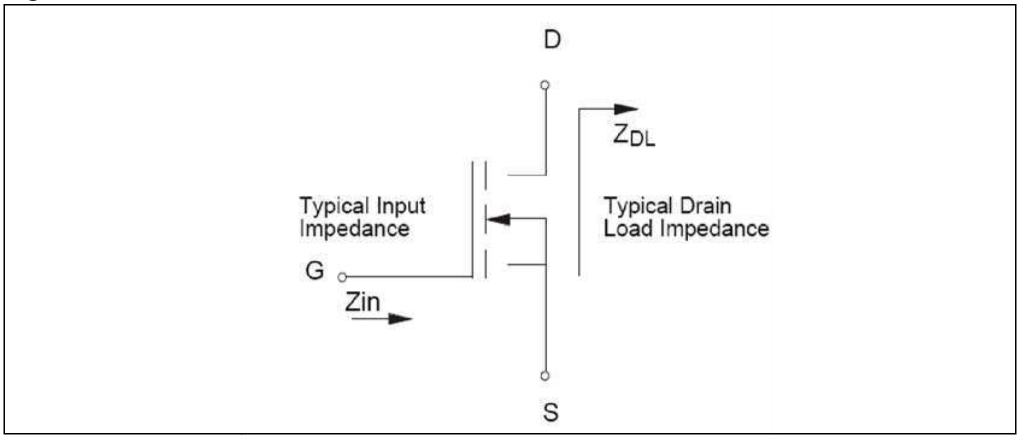


Table 6. Impedance data

Freq. (MHz)	Z_{IN} (Ω)	Z_{DL} (Ω)
860 MHz	1.11 - j 2.63	3.01 + j 5.34

Measured drain to drain and gate to gate respectively.

4 Typical performances

Figure 3. Capacitance vs drain voltage (per section)

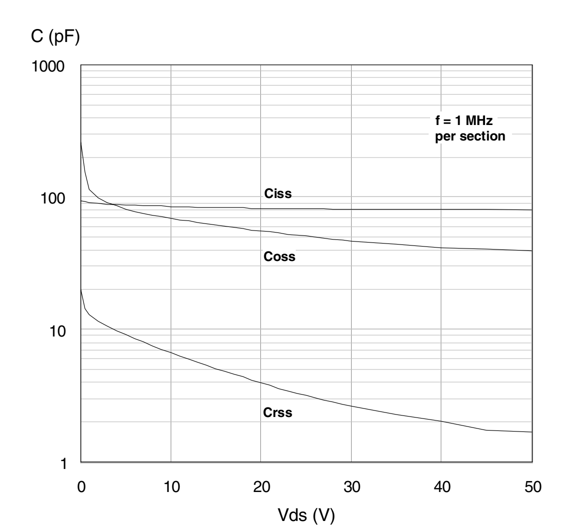


Figure 4. Gate-source voltage vs case temperature

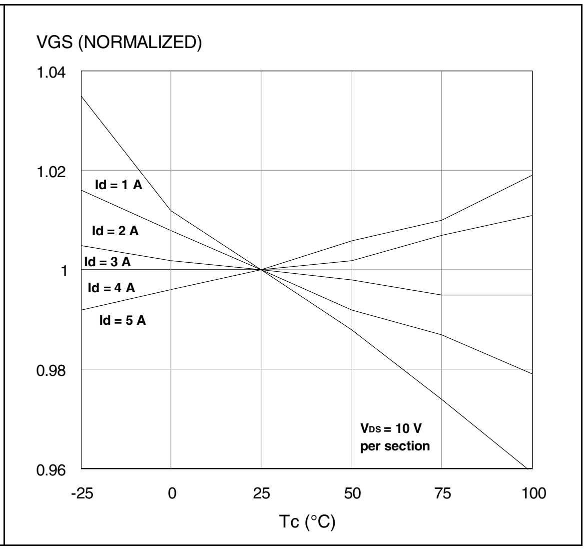


Figure 5. Drain current vs gate voltage

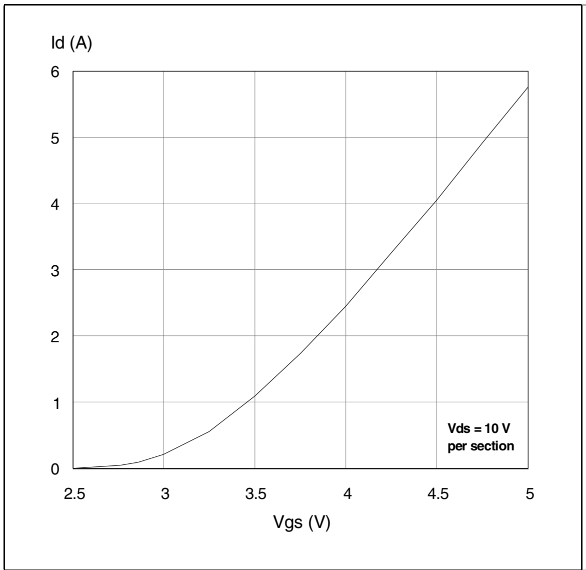


Figure 6. Output power vs input power

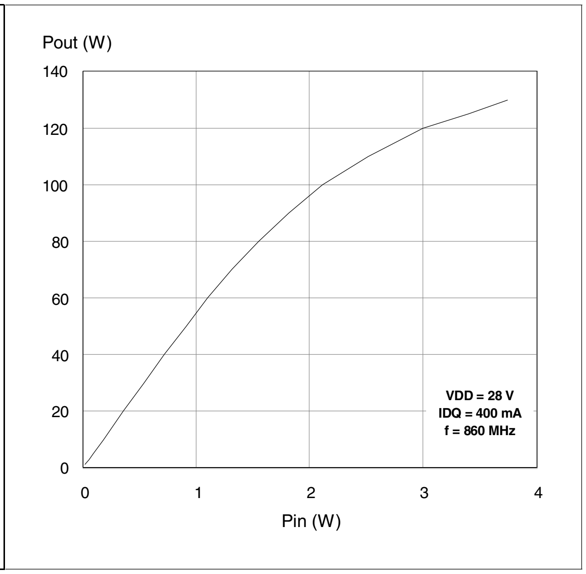


Figure 7. Power gain vs input power

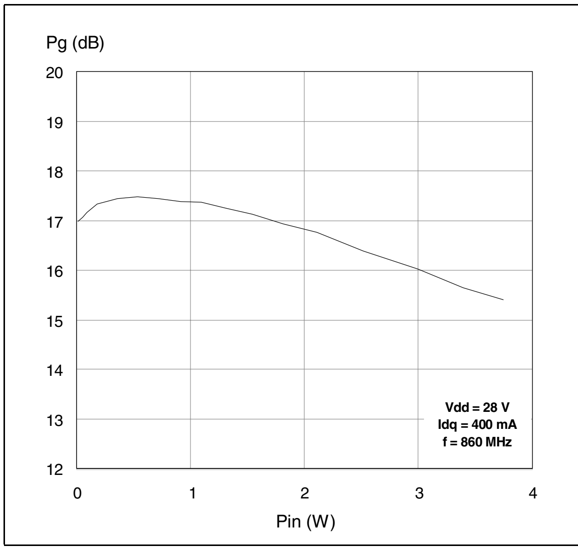


Figure 8. Efficiency vs output power

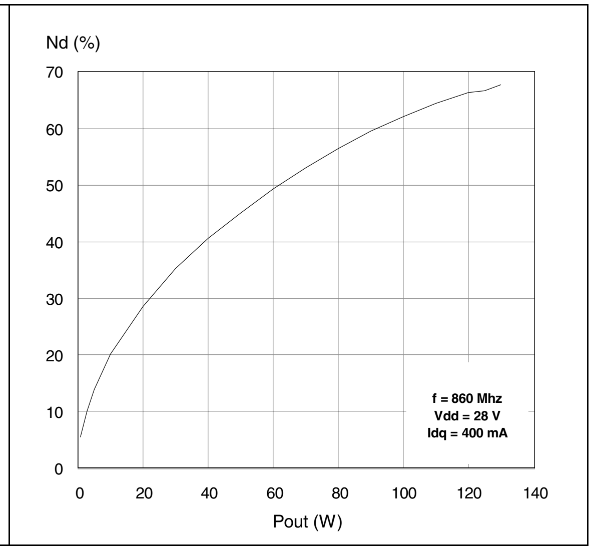


Figure 9. Power gain vs output power

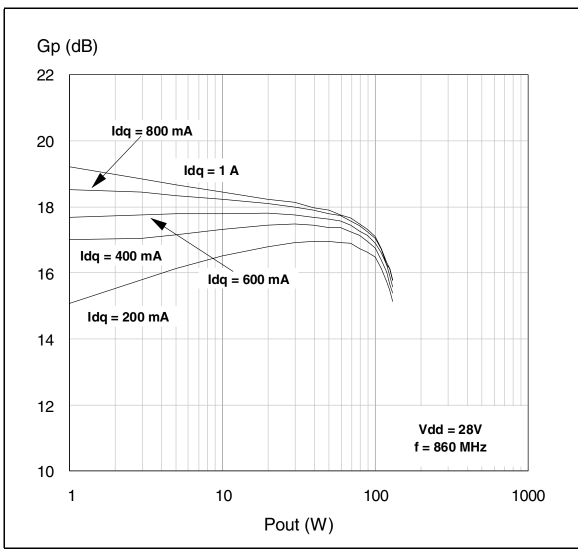


Figure 10. Intermodulation distortion vs output power

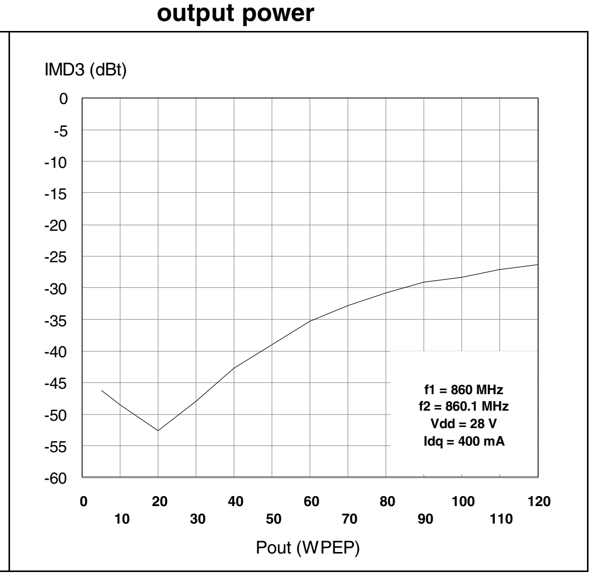


Figure 11. Output power vs drain voltage

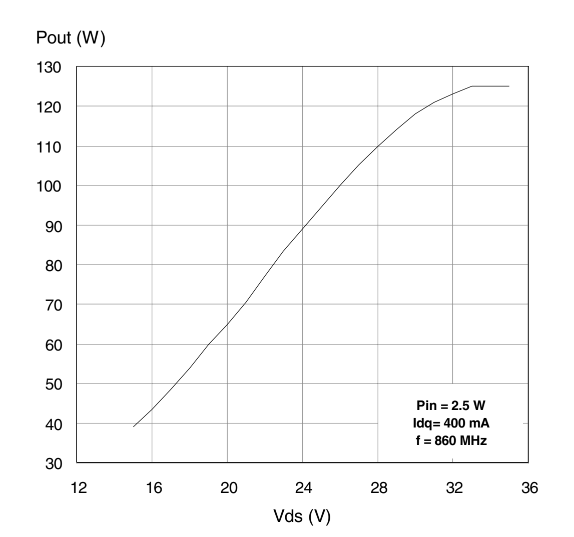


Figure 12. Output power vs bias current

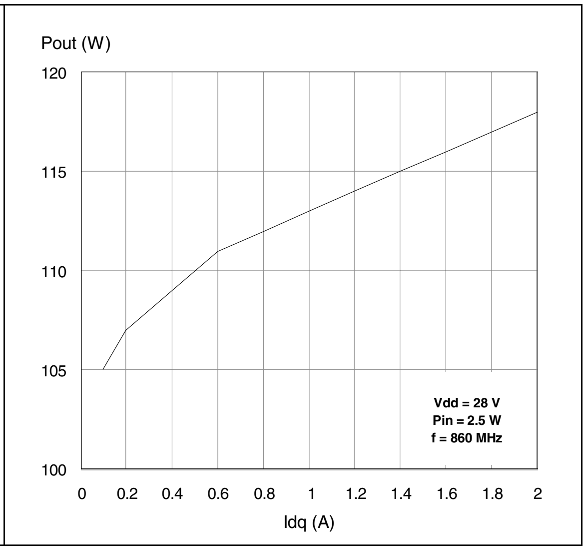
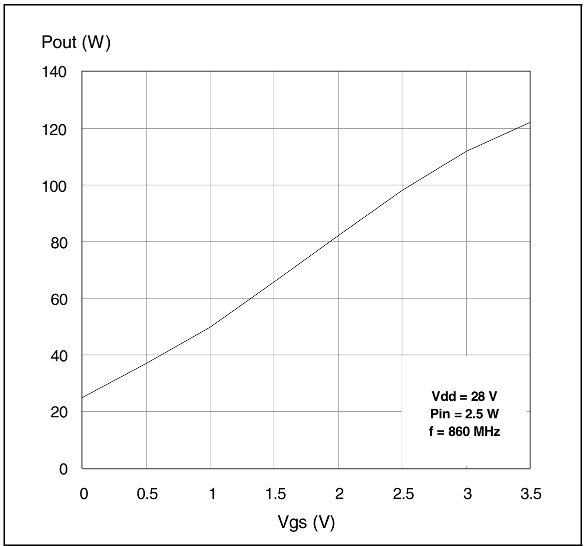
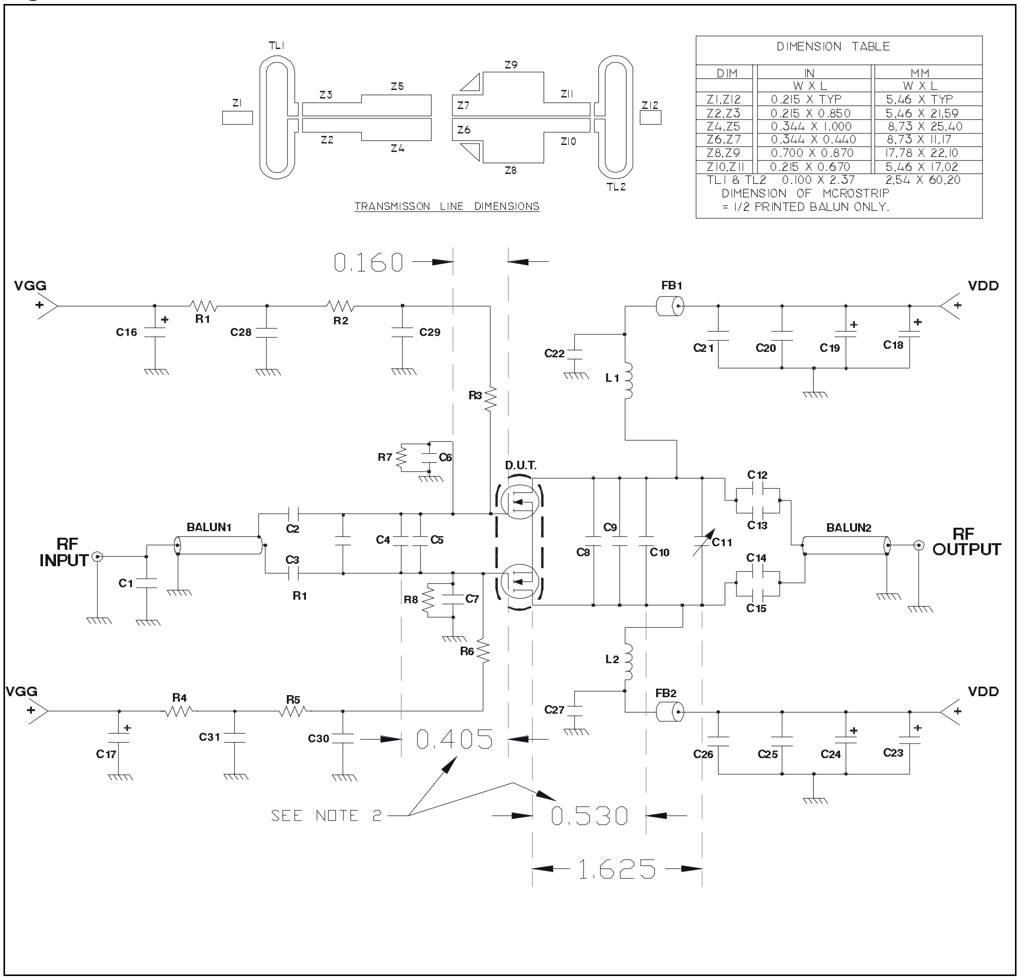


Figure 13. Output power vs gate-source voltage



5 Test circuit

Figure 14. 860 MHz test circuit schematic



Note: 1 Dimensions at component symbols are reference for component placement.

2 Gap between ground & transmission line = 0.056 [1.42] +0.002 [0.05] -0.000 [0.00] typ.

Table 7. 860 MHz test circuit component part list

Component	Description
C32	0.6 - 4.5 pF variable capacitor
C31, C28	0.01 µF ATC 200B surface-mount ceramic chip capacitor
C29, C30	62 pF ATC 100B surface-mount ceramic chip capacitor
C27, C22	270 pF ATC 100B surface-mount ceramic chip capacitor
C26, C21	1200 pF ATC 700B surface-mount ceramic chip capacitor
C25 ,C20	0.1 µF 500V surface-mount ceramic chip capacitor
C24, C19, C17, C16	10 µF 50V aluminum electrolytic radial lead surface-mount capacitor
C23, C18	100 µF 63V aluminum electrolytic radial lead capacitor
C15, C14, C13, C12	47 pF ATC 100B surface-mount ceramic chip capacitor
C11	0.8 - 8 pF Gigatrim variable capacitor
C10	3.0 pF ATC 100B surface-mount ceramic chip capacitoR
C9, C8	4.3 pF ATC 100B surface-mount ceramic chip capacitor
C7, C6, C5	10 pF ATC 100B surface-mount ceramic chip capacitor
C4	2.0 pF ATC 100B surface-mount ceramic chip capacitor
C3, C2	20 pF ATC 100B surface-mount ceramic chip capacitor
C1	1.3 pF ATC 100B surface-mount ceramic chip capacitor
R7, R8	100 Ohm 1/4 W surface-mount chip resistor
R6, R3	22 Ohm 1/4 W carbon leaded resistor
R5, R2	4.7 Ohm 1/4 W carbon leaded resistor
R4, R1	82 Ohm 1/4 W carbon leaded resistor
B2, B1	Balun, 50 Ohm Sucoform, OD 0.141 2.37 LG coaxial cable or equivalent
L2, L1	Inductor, 6 Turn Air-wound #18AWG ID=0.130[3,30] magnet wire
FB2, FB1	Surface-mount EMI shield bead
PCB	Ultralam 2000. 0.030” thk εr = 2.55, 2 Oz ED Cu both sides

Figure 15. 860 MHz production test fixture

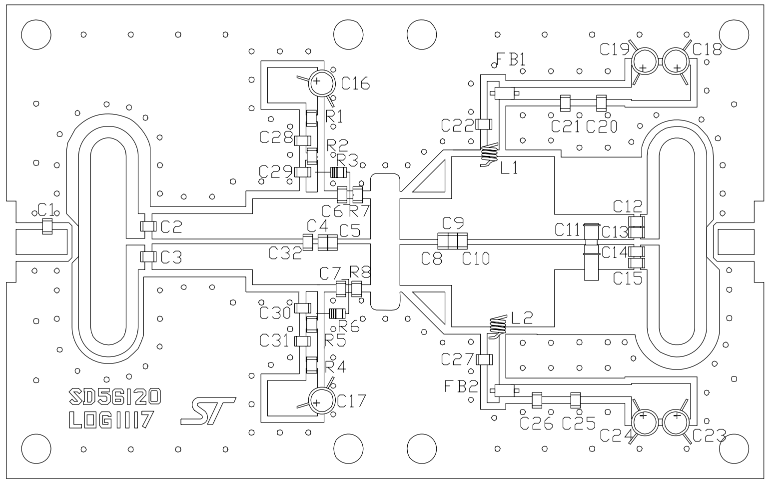
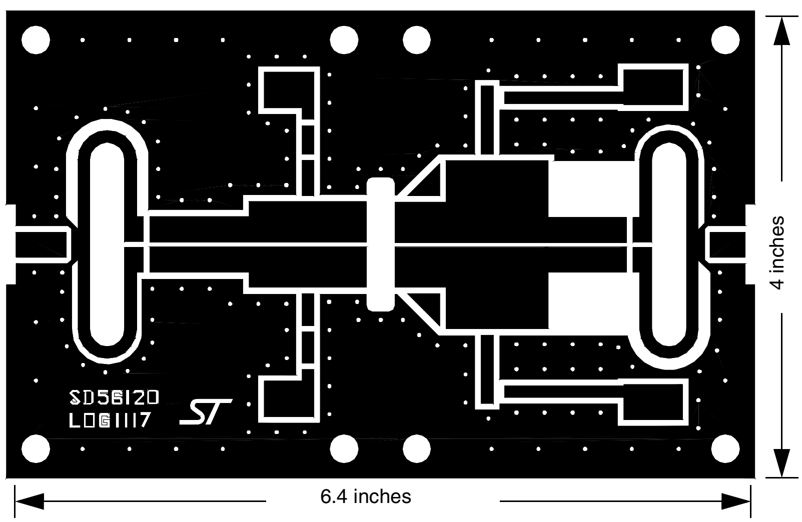


Figure 16. 860 MHz test circuit photomaster



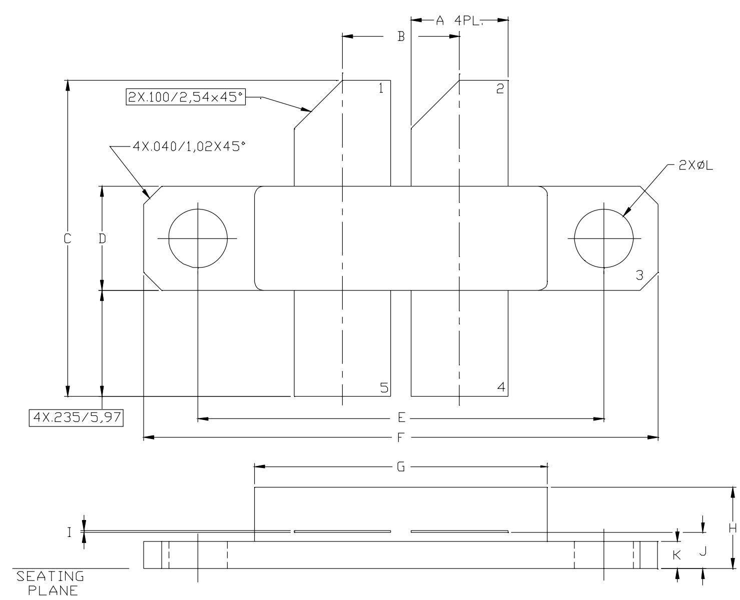
6 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*. ECOPACK® is an ST trademark.

Table 8. M246 (.230 x .650 WIDE 4/L BAL N/HERM W/FLG) mechanical data

Dim.	mm.			Inch		
	Min	Typ	Max	Min	Typ	Max
A	5.33		5.59	.210		.220
B	6.48		6.73	.255		.265
C	17.27		18.29	.680		.720
D	5.72		5.97	.225		.235
E		22.86			.900	
F	28.83		29.08	1.135		1.145
G	16.26		16.76	.640		.660
H	4.19		5.08	.165		.200
I	0.08		0.15	.003		.006
J	1.83		2.24	.072		.088
K	1.40		1.65	.055		.065
L	3.18		3.43	.125		.135

Figure 17. Package dimensions



Controlling dimension: Inches Ref. 7145054A

7 Revision history

Table 9. Document revision history

Date	Revision	Changes
18-Jun-2001	1	Initial release
12-Sep-2004	2	Few updates
13-Jul-2006	3	New template, added lead free info
02-Sep-2009	4	Updated document's title

Please Read Carefully:

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com