

HF/VHF/UHF RF power N-channel MOSFETs

Features

- Gold metallization
- Excellent thermal stability
- Common source configuration
- $P_{OUT} = 175\text{ W}$ min. with 15 dB gain @ 175 MHz
- Low $R_{DS(on)}$
- Thermally enhanced packaging for lower junction temperatures

Description

The SD2941-10 is a gold metalized N-channel MOS field-effect RF power transistor, intended for use in 50 V dc large signal applications up to 230 MHz. It offers 25% lower $R_{DS(ON)}$ than the industry standard, with 20% higher P_{SAT} than ST's SD2931-10 device. The SD2941-10 is housed in the low thermal non-pedestal package, offering 25% lower thermal resistance than the industry standard, thus rendering it the "best-in-class" transistor for ISM applications, where reliability and ruggedness are critical factors.

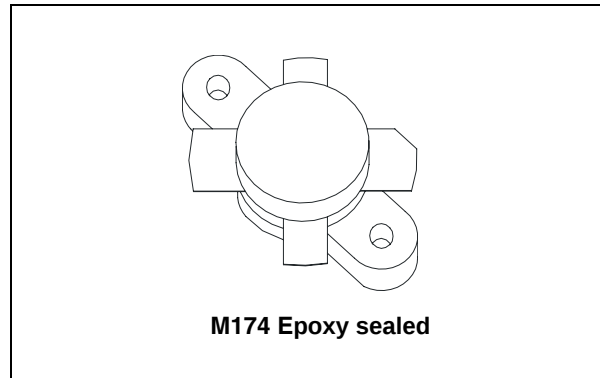


Figure 1. Pin connection

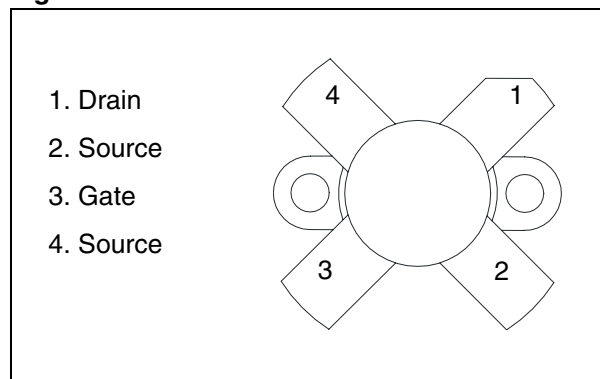


Table 1. Device summary

Order code	Marking	Base qty.	Package	Packaging ⁽¹⁾
SD2941-10W	SD2941-10 ⁽¹⁾	25 pcs	M174	Plastic tray

1. For more details please refer to [Chapter 7: Marking, packing and shipping specifications](#).

Contents

1 **Electrical data** 3

 1.1 Maximum rating 3

2 **Electrical characteristics** 4

3 **Impedance** 6

4 **Typical performance** 7

5 **Test circuit** 9

6 **Mechanical data** 12

7 **Marking, packing and shipping specifications** 14

8 **Revision history** 15



1 Electrical data

1.1 Maximum rating

($T_{CASE} = 25\text{ °C}$)

Table 2. Absolute maximum rating

Symbol	Parameter	Value	Unit
$V_{(BR)DSS}^{(1)}$	Drain source voltage	130	V
$V_{DGR}^{(1)}$	Drain-gate voltage ($R_{GS} = 1M\Omega$)	130	V
V_{GS}	Gate-source voltage	± 20	V
I_D	Drain current	20	A
P_{DISS}	Power dissipation	389	W
T_J	Max. operating junction temperature	200	°C
T_{STG}	Storage temperature	-65 to +150	°C

1. $T_J = 150\text{ °C}$

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Junction to case thermal resistance	0.45	°C/W

2 Electrical characteristics

($T_{CASE} = 25\text{ }^{\circ}\text{C}$)

Table 4. Static

Symbol	Test conditions		Min.	Typ.	Max.	Unit
$V_{(BR)DSS}^{(1)}$	$V_{GS} = 0\text{ V}$	$I_{DS} = 100\text{ mA}$	130			V
I_{DSS}	$V_{GS} = 0\text{ V}$	$V_{DS} = 50\text{ V}$			50	μA
I_{GSS}	$V_{GS} = 20\text{ V}$	$V_{DS} = 0\text{ V}$			250	nA
$V_{GS(Q)}^{(2)}$	$V_{DS} = 10\text{ V}$	$I_D = 250\text{ mA}$				V
$V_{DS(ON)}$	$V_{GS} = 10\text{ V}$	$I_D = 10\text{ A}$			2.0	V
G_{FS}	$V_{DS} = 10\text{ V}$	$I_D = 5\text{ A}$	5	6		mho
C_{ISS}	$V_{GS} = 0\text{ V}$	$V_{DS} = 50\text{ V}$		415		pF
C_{OSS}	$V_{GS} = 0\text{ V}$	$V_{DS} = 50\text{ V}$		236		pF
C_{RSS}	$V_{GS} = 0\text{ V}$	$V_{DS} = 50\text{ V}$		17		pF

1. $T_J = 150\text{ }^{\circ}\text{C}$

2. $V_{GS(Q)}$ sorted with alpha/numeric code marked on unit.

Table 5. Dynamic

Symbol	Test conditions	Min.	Typ.	Max.	Unit
P_{OUT}	$V_{DD} = 50\text{ V}$ $I_{DQ} = 250\text{ mA}$ $f = 175\text{ MHz}$	175	200	-	W
G_{PS}	$V_{DD} = 50\text{ V}$ $I_{DQ} = 250\text{ mA}$ $P_{OUT} = 175\text{ W}$ $f = 175\text{ MHz}$	14	15.8		dB
h_D	$V_{DD} = 50\text{ V}$ $I_{DQ} = 250\text{ mA}$ $P_{OUT} = 175\text{ W}$ $f = 175\text{ MHz}$	55	65		%
Load Mismatch	$V_{DD} = 50\text{ V}$ $I_{DQ} = 250\text{ mA}$ $P_{OUT} = 175\text{ W}$ $f = 175\text{ MHz}$ All phase angles	10:1			VSWR

Table 6. V_{GS} sorts

Symbol	Value	Symbol	Value	Symbol	Value
AA	1.5 - 1.6	E	2.4 - 2.5	P	3.3 - 3.4
BB	1.6 - 1.7	F	2.5 - 2.6	Q	3.4 - 3.5
CC	1.7 - 1.8	G	2.6 - 2.7	R	3.5 - 3.6
DD	1.8 - 1.9	H	2.7 - 2.8	S	3.6 - 3.7
EE	1.9 - 2.0	J	2.8 - 2.9	T	3.7 - 3.8
A	2.0 - 2.1	K	2.9 - 3.0	U	3.8 - 3.9
B	2.1 - 2.2	L	3.0 - 3.1	V	3.9 - 4.0
C	2.2 - 2.3	M	3.1 - 3.2		
D	2.3 - 2.4	N	3.2 - 3.3		

3 Impedance

Figure 2. Impedance data schematic

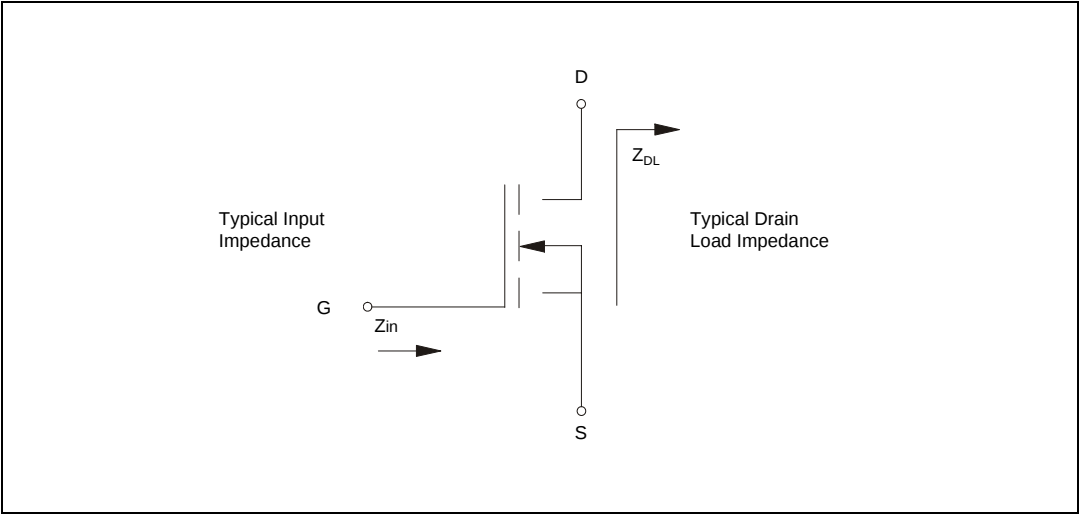


Table 7. Impedance data

f	$Z_{IN} (\Omega)$	$Z_{DL} (\Omega)$
30 MHz	$1.7 - j 5.7$	$6.8 + j 0.9$
175 MHz	$1.2 - j 2.0$	$2.0 + j 2.4$

4 Typical performance

Figure 3. Capacitance vs drain voltage

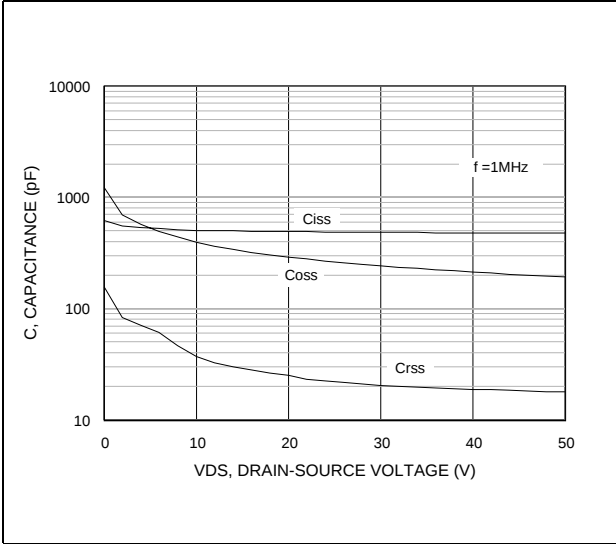


Figure 4. Drain current vs gate voltage

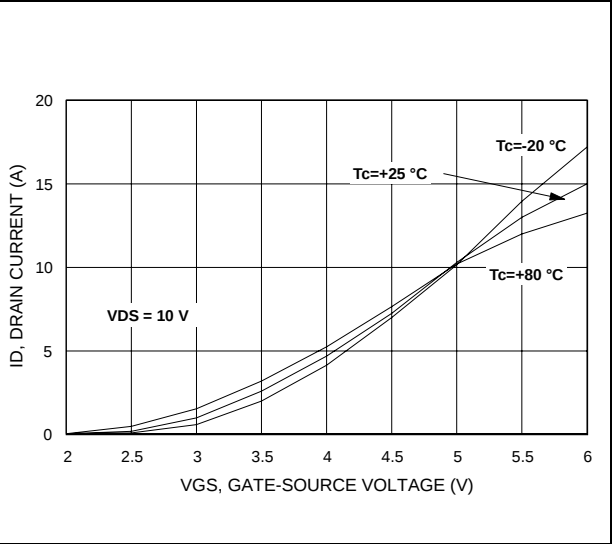


Figure 5. Maximum thermal resistance vs case temperature

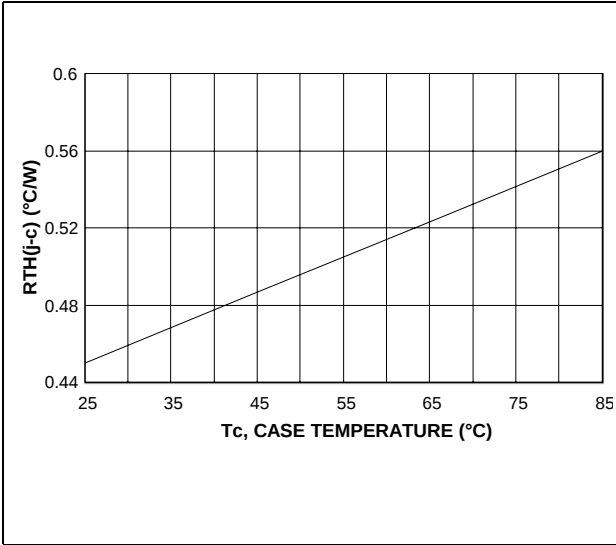


Figure 6. Safe operating area

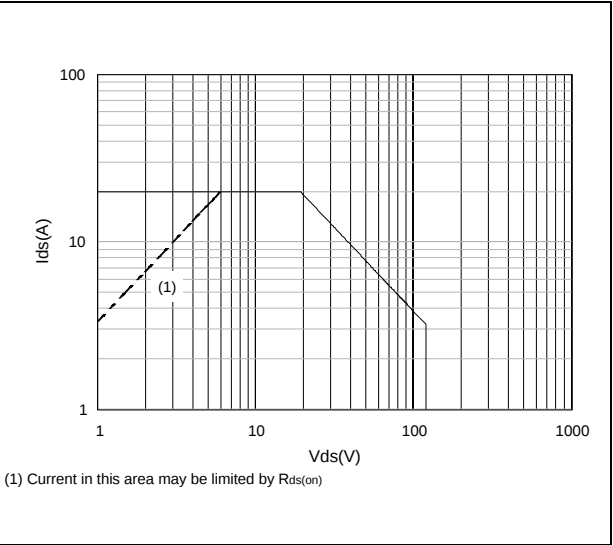


Figure 7. Power gain vs output power

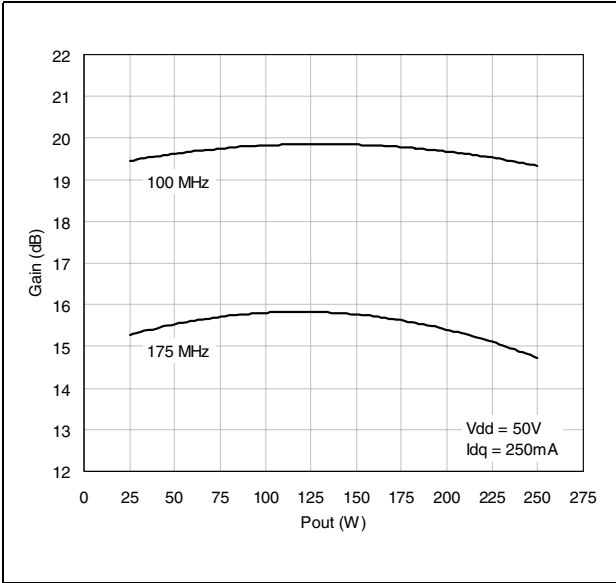


Figure 8. Efficiency vs output power

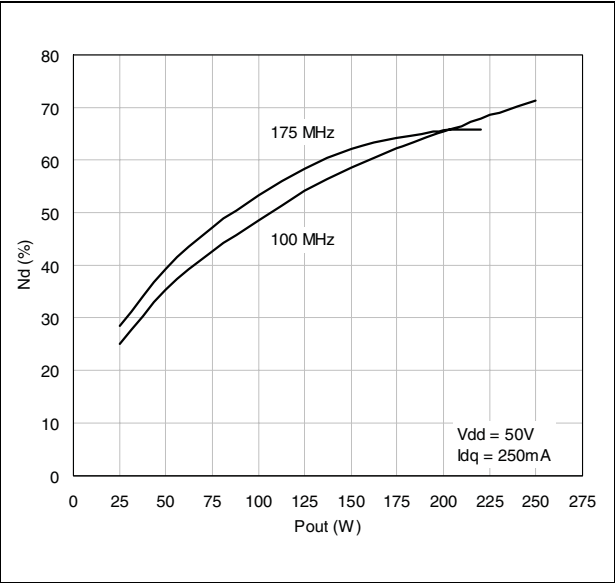
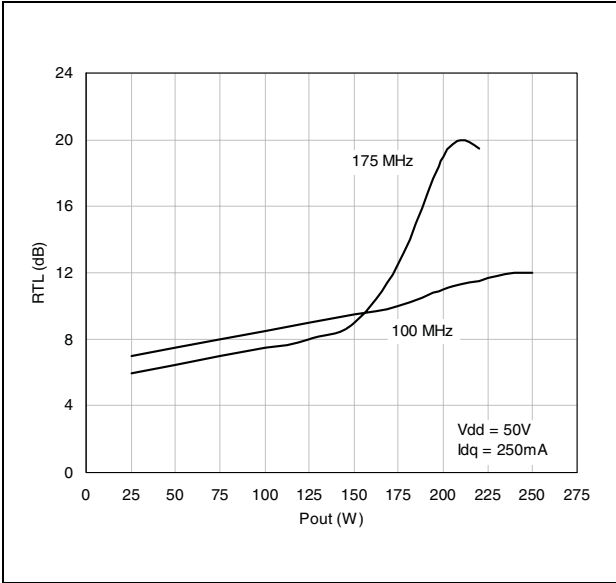
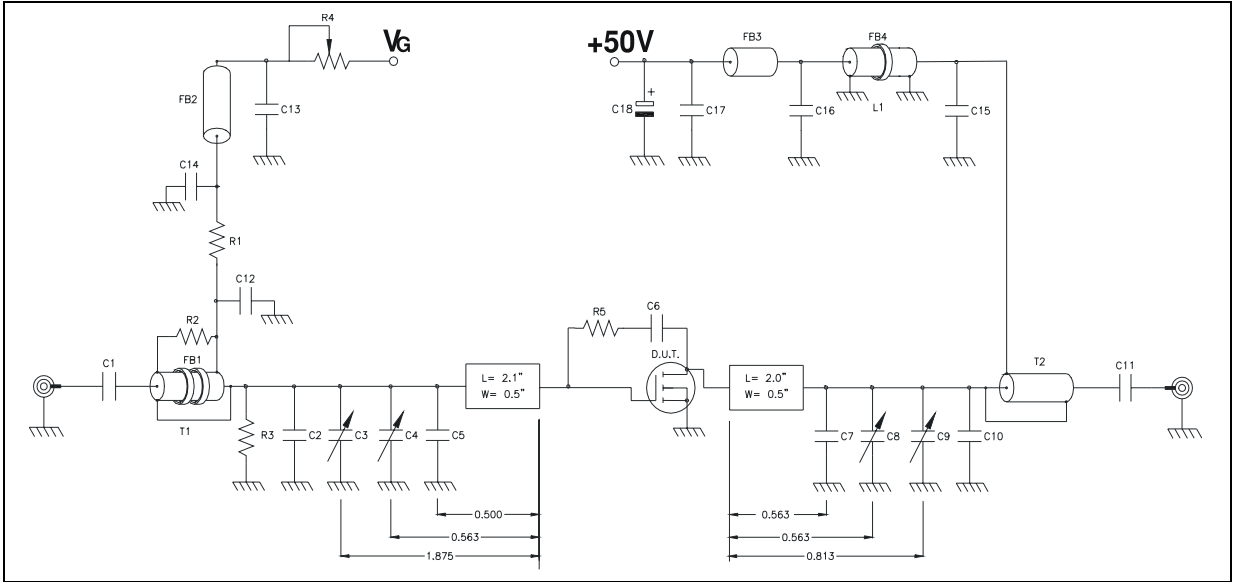


Figure 9. Input return loss vs output power



5 Test circuit

Figure 10. 30 MHz test circuit schematic (engineering test circuit)



Note: All dimension are in inches.

Table 8. 30 MHz test circuit component part list

Symbol	Description
T2	1:4 transformer, 25Ω semi-rigid coax .141 OD 6" Long
FB1	Toroid X 2, 0.5" OD .312" ID 850μ 2 turns
FB2, FB3	VK200
FB4	Shield bead, 1" OD 0.5" ID 850μ 3 Turns
L1	1/4 Wave Choke, 50Ω Semi-rigid coax .141 OD 12" Long
PCB	0.62" woven fiberglass, 1 oz. copper, 2 sides, $\epsilon_r = 2.55$
R1, R3	470Ω 1 W chip resistor
R2	360Ω 1/2 W resistor
R4	20 KΩ 10 turn potentiometer
R5	560Ω 1 W resistor
C1, C11	470 pF ATC chip cap
C2	43 pF ATC chip cap
C3, C8, C9	Arco 404, 12-65 pF
C4	Arco 423, 16-100 pF
C5	120 pF ATC chip cap
C6	0.01 μF ATC chip cap
C7	30 pF ATC chip cap

Table 8. 30 MHz test circuit component part list (continued)

Symbol	Description
C10	91 pF ATC chip cap
C12, C15	1200 pF ATC chip cap
C13, C14, C16, C17	0.01 μ F / 500 V chip cap
C18	10 μ F 63 V electrolytic capacitor

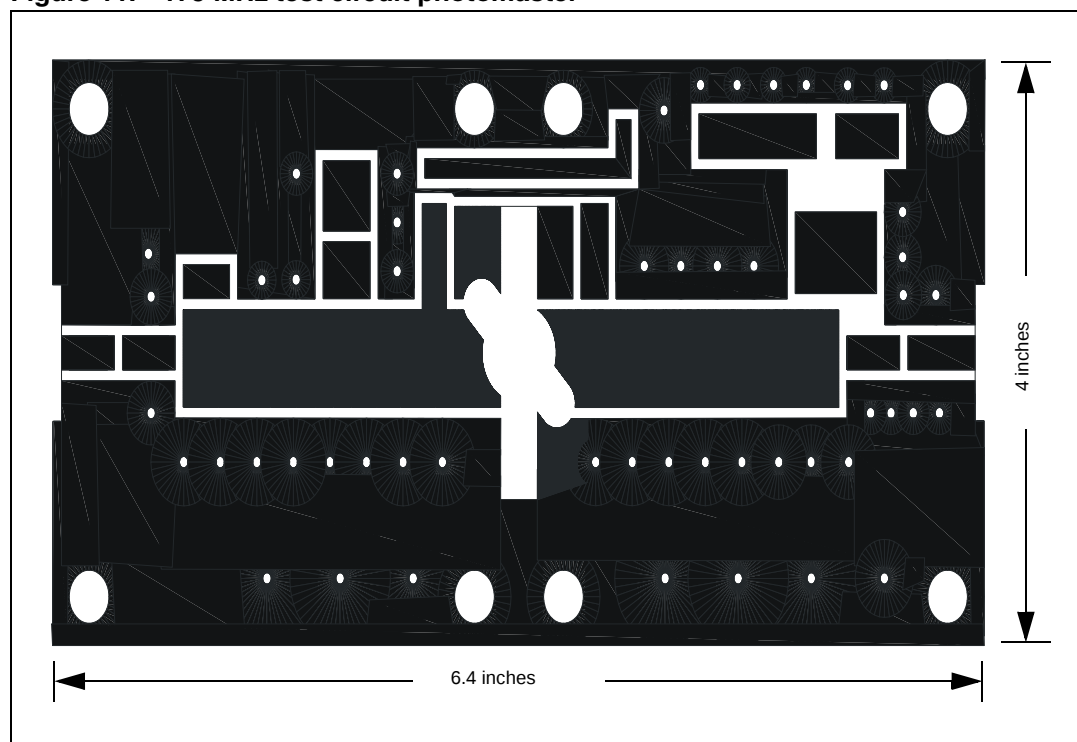
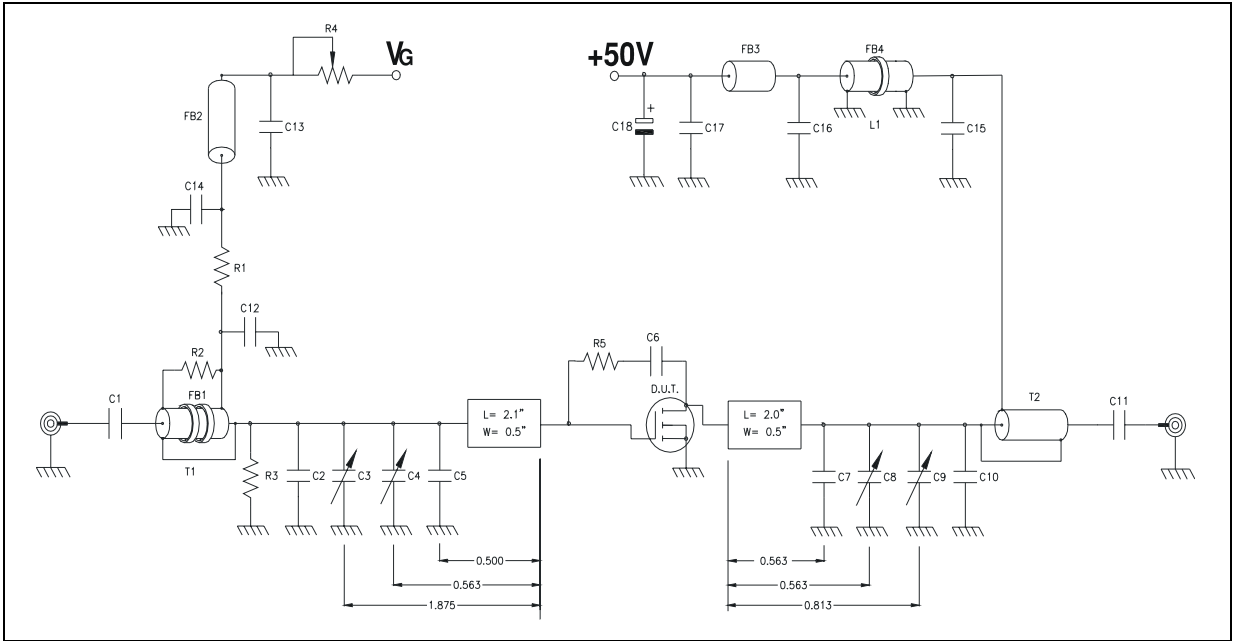
Figure 11. 175 MHz test circuit photomaster

Figure 12. 175 MHz test circuit

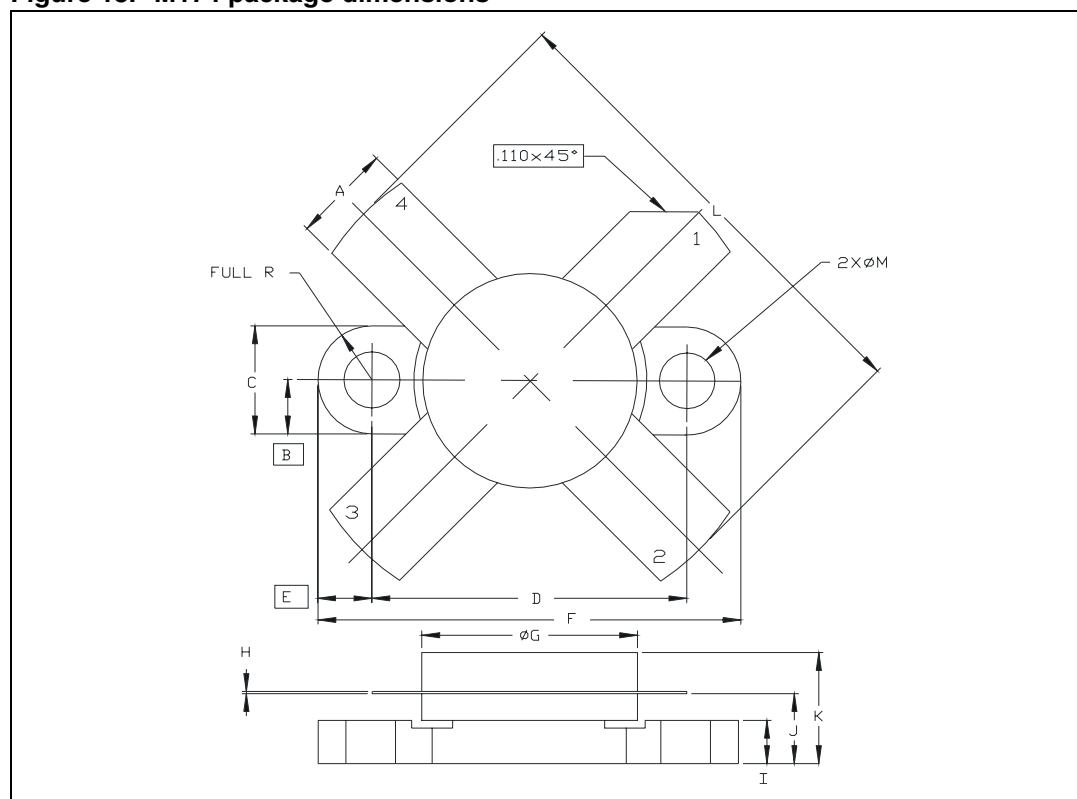


6 Mechanical data

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 9. M174 (.500 DIA 4/L N/HERM W/FLG)

DIM.	mm.			inch		
	min.	typ.	max	min.	typ.	max
A	5.56		5.584	0.219		0.230
B		3.18			0.125	
C	6.22		6.48	0.245		0.255
D	18.28		18.54	0.720		0.730
E		3.18			0.125	
F	24.64		24.89	0.970		0.980
G	12.57		12.83	0.495		0.505
H	0.08		0.18	0.003		0.007
I	2.11		3.00	0.083		0.118
J	3.81		4.45	0.150		0.175
K			7.11			0.280
L	25.53		26.67	1.005		1.050
M	3.05		3.30	0.120		0.130

Figure 13. M174 package dimensions

7 Marking, packing and shipping specifications

Table 10. Packing and shipping specifications

Order code	Packaging	Pcs per tray	Dry pack humidity	V _{GS} code	Lot code
SD2941-10W	Plastic tray	25	< 10 %	Not mixed	Not mixed

Figure 14. Marking layout

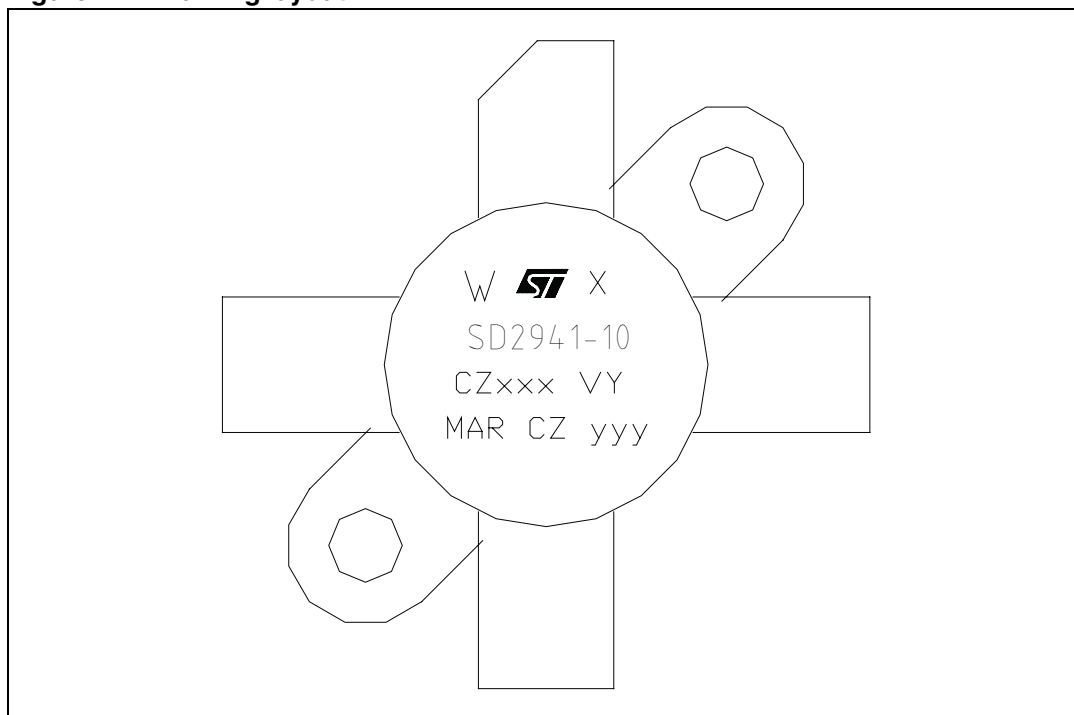


Table 11. Marking specifications

Symbol	Description
W	Wafer process code
X	V _{GS} sort
CZ	Assembly plant
xxx	Last 3 digit of diffusion lot
VY	Diffusion plant
MAR	Country of origin
CZ	Test and finishing plant
y	Assembly year
yy	Assembly week

8 Revision history

Table 12. Document revision history

Date	Revision	Changes
15-Nov-2005	1	Initial release
06-Apr-2006	2	Complete version
13-Apr-2006	3	V _{DS(ON)} updated
19-Oct-2011	4	Inserted <i>Section 7: Marking, packing and shipping specifications</i> . Minor text changes in the title and description on the coverpage.

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY TWO AUTHORIZED ST REPRESENTATIVES, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2011 STMicroelectronics - All rights reserved

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

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[STMicroelectronics:](#)

[SD2941-10](#) [SD2941-10R](#)