

## RF power module based on the PD85050S for mobile radio applications

Data brief

### Features

- N-channel enhancement-mode lateral MOSFETs ( $I_{DD} \cong 0$  @  $V_{DD} = 12.5$  V,  $V_{GG} = 0$  V)
- $P_{out} > 70$  W,  $\eta_{tot} = 50\%$  (typ) @  $V_{DD} = 12.5$  V,  $V_{GG} = 5$  V,  $P_{in} = 5$  dBm
- Broadband frequency range: 380-470 MHz
- High moisture sensitivity level
- Low power control current  $I_{GG} = 3$  mA (typ) @  $V_{GG} = 5$  V
- ESD protection
- Development kit available to aid in production or system integration.
- RoHS compliant

### Description

The STEVAL-TDR034V1 demonstration board is a 70 W hybrid RF power module for 12.5 V mobile radios that operate in the 380-470 MHz band.

This module is a 3-stage lineup power amplifier using the PD84002, the PD85006L-E and two PD85050S specially designed for broadband operation, which allows power control, high gain and high efficiency.

The board uses devices in plastic packages to ensure a high moisture sensitivity level.

For additional information, please refer to [www.st.com/rf](http://www.st.com/rf).

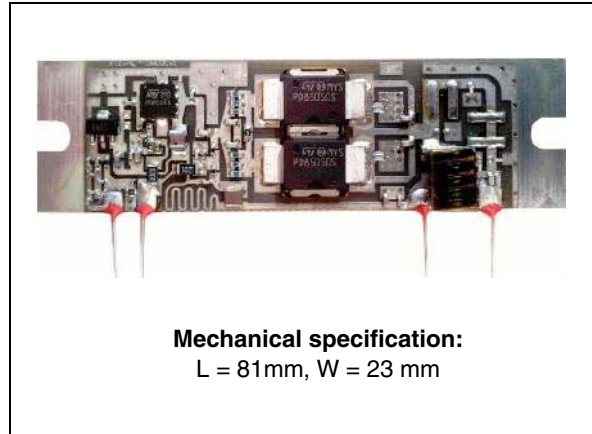


Table 1. Device summary

Order code
STEVAL-TDR034V1

# 1 Electrical characteristics

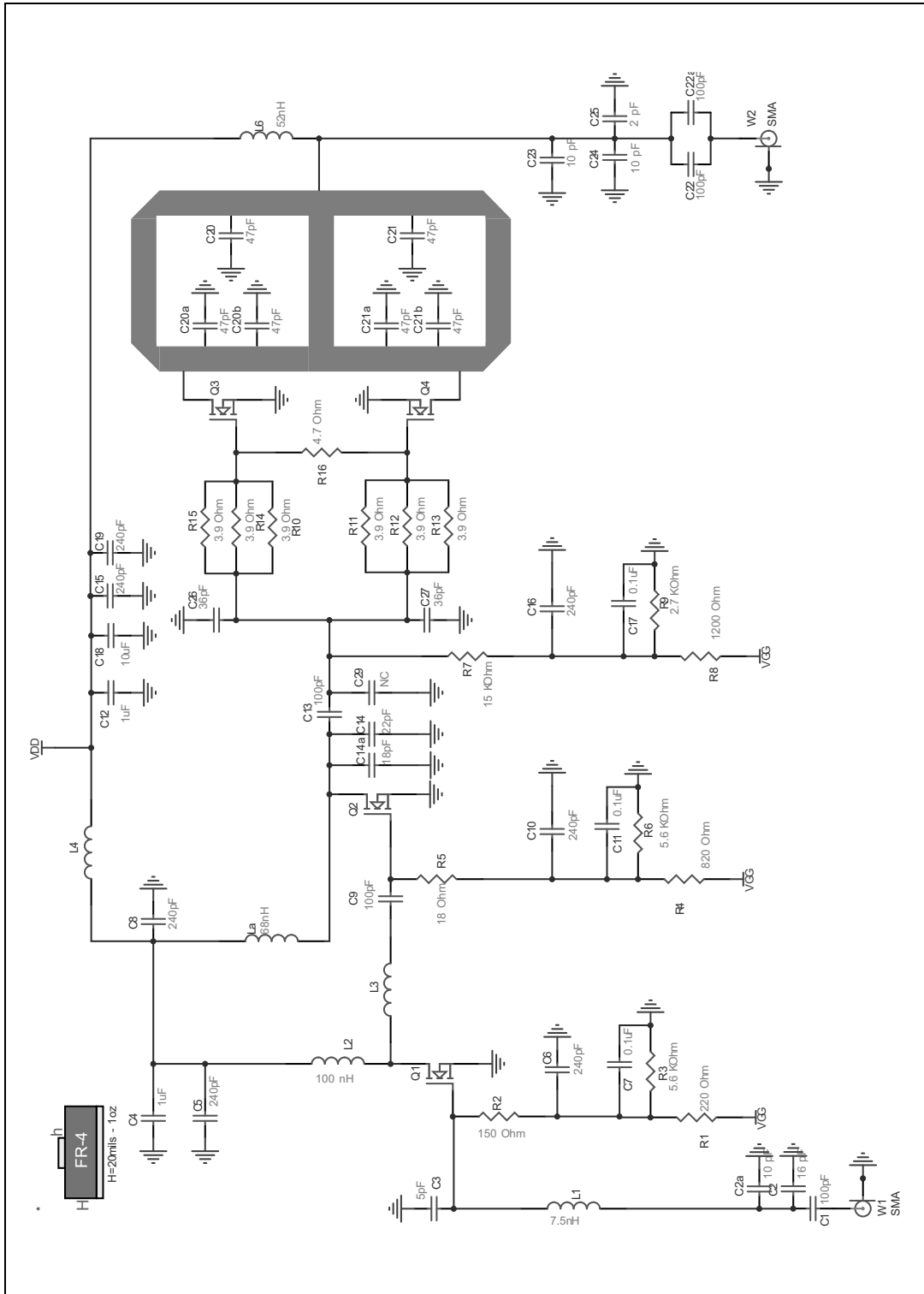
**Table 2. Electrical specification ( $T_{\text{case}} = +25\text{ °C}$ ,  $Z_G = Z_L = 50\ \Omega$ , unless otherwise specified)**

Symbol	Test conditions		Min.	Typ.	Max.	Unit
F	Frequency range		380	-	470	MHz
P <sub>out</sub>	Output power	V <sub>DD</sub> = 12.5 V		70		W
$\eta_T$	Total efficiency	V <sub>GG</sub> = 5 V		50		%
2fo	2nd harmonic	P <sub>in</sub> = 5 dBm			-55	dBc
$\rho_{\text{in}}$	Input V <sub>SWR</sub>				-3	dB
I <sub>GG</sub>	Gate current	V <sub>DD</sub> = 0 V, V <sub>GG</sub> = 5 V, P <sub>in</sub> = 0 W		3		mA
I <sub>DD</sub>	Leakage current	V <sub>DD</sub> = 17 V, V <sub>GG</sub> = 0 V, P <sub>in</sub> = 0 W		0		mA
-	Stability	V <sub>DD</sub> = 12.5 - 15 V, P <sub>in</sub> = 5 dBm, P <sub>out</sub> = 70 W (V <sub>GG</sub> control), Load V <sub>SWR</sub> = 4:1	No parasitic oscillation			-
-	Load V <sub>SWR</sub> tolerance	V <sub>DD</sub> = 15 V, P <sub>in</sub> = 5 dBm, P <sub>out</sub> = 70 W (V <sub>GG</sub> control), Load V <sub>SWR</sub> = 20:1	No degradation or destruction			-

All parameters, conditions, ratings and limits are subject to change without notice.

## 2 Schematic diagram

Figure 1. STEVAL-TDR034V1 circuit schematic



### 3 PCB layout

Figure 2. Board layout

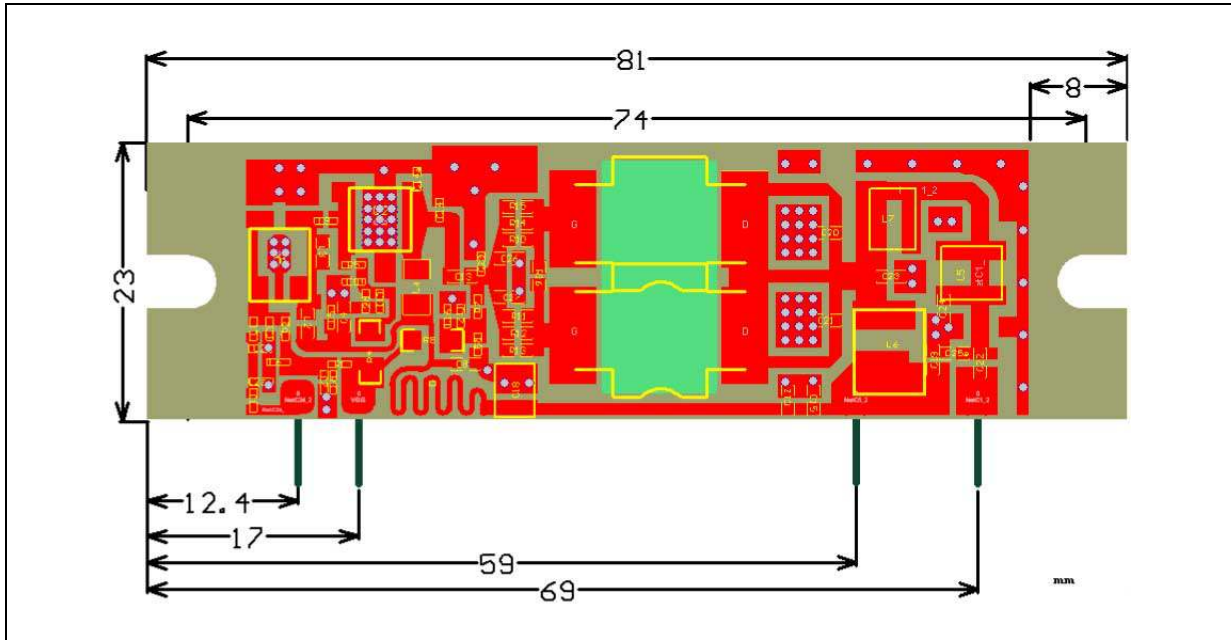


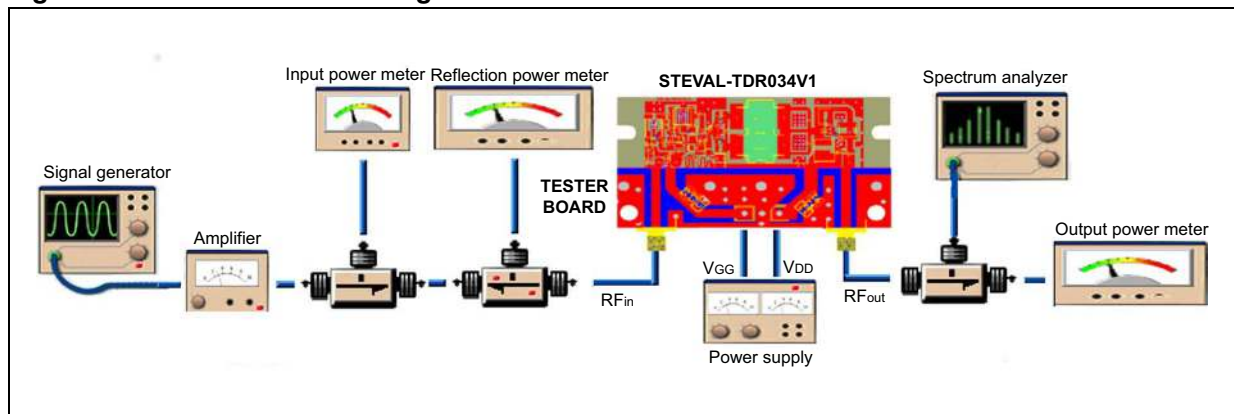
Table 3. Component list

Designator	Manufacturer	Quantity	Value	Manufacturer part number	Footprint
C1, C9	Murata	2	100 pF	GRM1555C1H101JA01	0402
C2	Murata	1	16 pF	GJM1555C1H160GB01#	0402
C2a	Murata	1	10 pF	GJM1555C1H100JZ01#	0402
C3	Murata	1	5 pF	GRM1555C1H5R0GA01#	0402
C4	Murata	1	1 $\mu$ F	GRM188R61E105KA12#	0603
C5, C6, C8, C10, C15, C16, C19	Murata	7	240 pF	GRM1555C1H241JA01#	0402
C7, C11, C17	Murata	3	0.1 $\mu$ F	GRM155C81E104KA12#	0402
C12	Murata	1	1 $\mu$ F	GRM188B31E105KA75#	0603
C13	Murata	1	100 pF	GQM1885C1H101GB01#	0603
C22, C22a	Murata	2	100 pF	GQM2195C1H101JB01#	0805
C14	Murata	1	27 pF	GRM1555C1H270FA01#	0402
C14a	Murata	1	18 pF	GRM1555C1H180JZ01#	0402
C18	Murata	1	10 $\mu$ F	GRM32ER71H106KA12#	1210
C20, C20a, C20b, C21, C21a, C21b	Murata	6	47 pF	GQM1875C2E470GB12#	0603
C23, C24	Murata	2	10 pF	GQM1875C2E100JB12#	0603

Table 3. Component list (continued)

Designator	Manufacturer	Quantity	Value	Manufacturer part number	Footprint
C25	Murata	1	2 pF	GCM1885C2A2R0CB01#	0603
C26, C27	Murata	2	36 pF	GRM1555C1H360GA01#	0603
C29	Murata	1	NC		
L1	Coilcraft	1	7.5 nH	0402CS-7N5XJLW	0402
L2	Coilcraft	1	100 nH	0603HP-R10X_LU	0603
L6	Coilcraft	1	52 nH	NA5778-AE	
La	Coilcraft	1	68 nH	1008HQ-68NX_LC	0402
Q1	STM	1	SOT89	PD84002	SOT89
Q2	STM	1	PowerFlat	PD85006L	PowerFlat
Q3, Q4	STM	2	PSO-10	PD85050S	PSO-10
R1	Vishay	1	220 Ω	CRCW0402220RFKED	0402
R2	Vishay	1	150 Ω	CRCW0402150RFKED	0402
R3, R6	Vishay	2	5.6 KΩ	CRCW04025K60FKED	0402
R4	Vishay	1	820 Ω	CRCW1206820RFKEA	1206
R5	Vishay	1	18 Ω	CRCW040218R0FKED	0402
R7	Vishay	1	15 KΩ	CRCW040215K0FKED	0402
R8	Vishay	1	1200 Ω	CRCW12061K20FKEA	1206
R9	Vishay	1	2,7 KΩ	CRCW04022K7CEED	0402
R10, R11, R12, R13, R14, R15	KOA Speer	6	3.9 Ω	RK73H1JTTD3R90F	0603
R16	Vishay	1	4.7 Ω	CRCW06034R70FKEA	0603
Substrate			FR-4	20 mils 1 oz copper	

Figure 3. Test board block diagram



Note: **Test board:** All measurements have been done including 50 Ω lines input and output with  $I_L = 0.06$  dB into 380 MHz - 500 MHz

Table 4. Test board component list

Designator	Manufacturer	Quantity	Value	Manufacturer part number	Type
C1, C2		2	100 $\mu$ F		Tantalum
C3, C4	Murata	2	10 $\mu$ F	GRM42-6X7R225K25D52K	0402
C5, C6	Murata	2	2.2 $\mu$ F	GRM42-6X5R106K25D539	0603
Substrate			FR-4	60 mils 1 oz copper	

## 4 Revision history

**Table 5. Document revision history**

Date	Revision	Changes
11-Feb-2013	1	Initial release.

**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.

© 2013 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](http://www.st.com)