

# NE5550234

R09DS0039EJ0300

Rev.3.00

Mar 12, 2013

## Silicon Power MOS FET

### FEATURES

- High Output Power :  $P_{out} = 33.0$  dBm TYP. ( $V_{DS} = 7.5$  V,  $I_{Dset} = 40$  mA,  $f = 460$  MHz,  $P_{in} = 15$  dBm)
- High power added efficiency :  $\eta_{add} = 68\%$  TYP. ( $V_{DS} = 7.5$  V,  $I_{Dset} = 40$  mA,  $f = 460$  MHz,  $P_{in} = 15$  dBm)
- High Linear gain :  $G_L = 23.5$  dB TYP. ( $V_{DS} = 7.5$  V,  $I_{Dset} = 40$  mA,  $f = 460$  MHz,  $P_{in} = 0$  dBm)
- High ESD tolerance
- Suitable for VHF to UHF-BAND Class-AB power amplifier.

### APPLICATIONS

- 150 MHz Band Radio System
- 460 MHz Band Radio System
- 900 MHz Band Radio System

### ORDERING INFORMATION

Part Number	Order Number	Package	Marking	Supplying Form
NE5550234	NE5550234-AZ	3-pin power minimold (34 PKG) (Pb-Free)	V5	<ul style="list-style-type: none"> <li>• 12 mm wide embossed taping</li> <li>• Gate pin faces the perforation side of the tape</li> </ul>
NE5550234-T1	NE5550234-T1-AZ			<ul style="list-style-type: none"> <li>• 12 mm wide embossed taping</li> <li>• Gate pin faces the perforation side of the tape</li> <li>• Qty 1 kpcs/reel</li> </ul>

**Remark** To order evaluation samples, please contact your nearby sales office.

Part number for sample order: NE5550234

### ABSOLUTE MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ , unless otherwise specified)

Operation in excess of any one of these parameters may result in permanent damage.

Parameter	Symbol	Ratings	Unit
Drain to Source Voltage	$V_{DS}$	30	V
Gate to Source Voltage	$V_{GS}$	6.0	V
Drain Current	$I_{DS}$	0.6	A
Drain Current (50% Duty Pulsed)	$I_{DS-pulse}$	1.2	A
Total Power Dissipation <sup>Note</sup>	$P_{tot}$	12.5	W
Channel Temperature	$T_{ch}$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-65 to +150	$^\circ\text{C}$

Note: Value at  $T_C = 25^\circ\text{C}$

### CAUTION

Observe precautions when handling because these devices are sensitive to electrostatic discharge.

The mark <R> shows major revised points.

The revised points can be easily searched by copying an "<R>" in the PDF file and specifying it in the "Find what:" field.

**RECOMMENDED OPERATING RANGE (T<sub>A</sub> = 25°C)**

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V <sub>DS</sub>		–	7.5	9.0	V
Gate to Source Voltage	V <sub>GS</sub>		1.65	2.20	2.85	V
Drain Current	I <sub>DS</sub>		–	0.38	–	A
Input Power	P <sub>in</sub>	f = 460 MHz, V <sub>DS</sub> = 7.5 V	–	15	20	dBm

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C, unless otherwise specified)**

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
<b>DC Characteristics</b>						
Gate to Source Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> = 6.0 V	–	–	100	nA
Drain to Source Leakage Current (Zero Gate Voltage Drain Current)	I <sub>DSS</sub>	V <sub>DS</sub> = 25 V	–	–	10	μA
Gate Threshold Voltage	V <sub>th</sub>	V <sub>DS</sub> = 7.5 V, I <sub>DS</sub> = 1.0 mA	1.15	1.65	2.25	V
Drain to Source Breakdown Voltage	BV <sub>DSS</sub>	I <sub>DS</sub> = 10 μA	25	38	–	V
Transconductance	G <sub>m</sub>	V <sub>DS</sub> = 7.5 V, I <sub>DS</sub> = 140±20 mA	–	0.44	–	S
Thermal Resistance	R <sub>th</sub>	Channel to Case	–	10.0	–	°C/W
<b>RF Characteristics</b>						
Output Power	P <sub>out</sub>	f = 460 MHz, V <sub>DS</sub> = 7.5 V,	31.5	33.0	–	dBm
Drain Current	I <sub>DS</sub>	P <sub>in</sub> = 15 dBm,	–	0.38	–	A
Power Drain Efficiency	η <sub>d</sub>	I <sub>Dset</sub> = 40 mA (RF OFF)	–	70	–	%
Power Added Efficiency	η <sub>add</sub>		–	68	–	%
Linear Gain	G <sub>L</sub> <sup>Note 1</sup>		–	23.5	–	dB
Load VSWR Tolerance	<sup>Note 2</sup>	f = 460 MHz, V <sub>DS</sub> = 9.0 V, P <sub>in</sub> = 15 dBm, I <sub>Dset</sub> = 40 mA (RF OFF) Load VSWR=20:1(All Phase)	No Destroy			
Output Power	P <sub>out</sub>	f = 157 MHz, V <sub>DS</sub> = 7.5 V,	–	33.0	–	dBm
Drain Current	I <sub>DS</sub>	P <sub>in</sub> = 15 dBm,	–	0.36	–	A
Power Drain Efficiency	η <sub>d</sub>	I <sub>Dset</sub> = 40 mA (RF OFF)	–	74	–	%
Power Added Efficiency	η <sub>add</sub>		–	73	–	%
Linear Gain	G <sub>L</sub> <sup>Note 3</sup>		–	25.8	–	dB
Output Power	P <sub>out</sub>	f = 900 MHz, V <sub>DS</sub> = 7.5 V,	–	32.2	–	dBm
Drain Current	I <sub>DS</sub>	P <sub>in</sub> = 17 dBm,	–	0.35	–	A
Power Drain Efficiency	η <sub>d</sub>	I <sub>Dset</sub> = 40 mA (RF OFF)	–	62	–	%
Power Added Efficiency	η <sub>add</sub>		–	60	–	%
Linear Gain	G <sub>L</sub> <sup>Note 4</sup>		–	18.3	–	dB

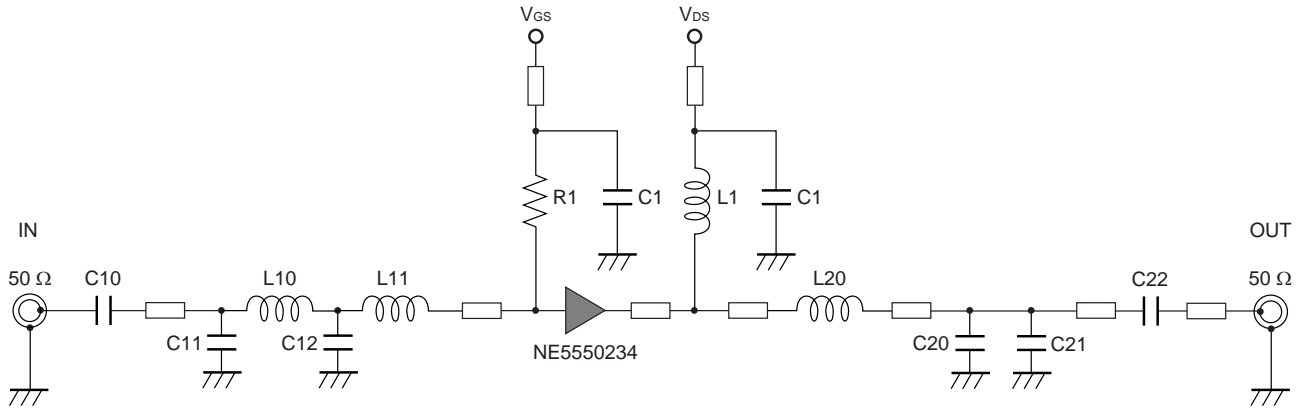
Notes: 1. P<sub>in</sub> = 0 dBm

2. These characteristics values are measurement using measurement tools especially by RENESAS.

3. P<sub>in</sub> = –5 dBm4. P<sub>in</sub> = 7 dBm**Remark** DC performance is 100% testing. RF performance is testing several samples per wafer.

The wafer rejection criterion for standard devices is 1 reject for several samples.

TEST CIRCUIT SCHEMATIC FOR 460 MHz

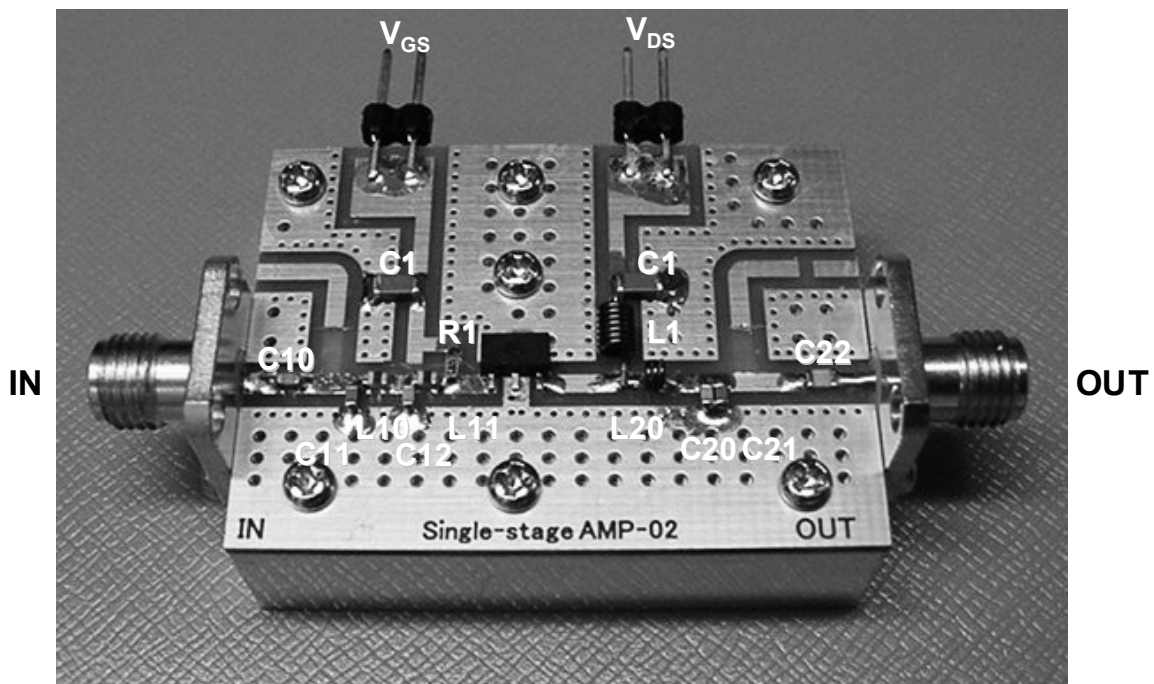


COMPONENTS OF TEST CIRCUIT FOR MEASURING ELECTRICAL CHARACTERISTICS

Symbol	Value	Type	Maker
C1	1 $\mu$ F	GRM31MR71H105KA88L	Murata
C10	27 pF	GRM1882C1H270JA01	Murata
C11	3.9 pF	GRM1882C1H3R9CZ01	Murata
C12	18 pF	GRM1882C1H180JA01	Murata
C20	12 pF	GRM1882C1H120JA01	Murata
C21	1.5 pF	GRM1882C1H1R5CZ01	Murata
C22	100 pF	GRM2162C1H101JA01D	Murata
R1	4.7 k $\Omega$	1/10 W Chip Resistor SSM_RG1608PB472	SSM
L1	47.2 nH	$\phi$ 0.4 mm, $\phi$ D = 2 mm, 7 Turns	Ohesangyou
L10, L11	12 nH	LL1608-FS12NJ	TOKO
L20	7.8 nH	$\phi$ 0.4 mm, $\phi$ D = 1.4 mm, 3 Turns	Ohesangyou
PCB	-	R1766, t = 0.8 mm, $\epsilon$ = 4.8, size = 30 $\times$ 40 mm	Panasonic
SMA Connector	-	WAKA 01K0790-20	WAKA

<R>

COMPONENT LAYOUT OF TEST CIRCUIT FOR 460 MHz

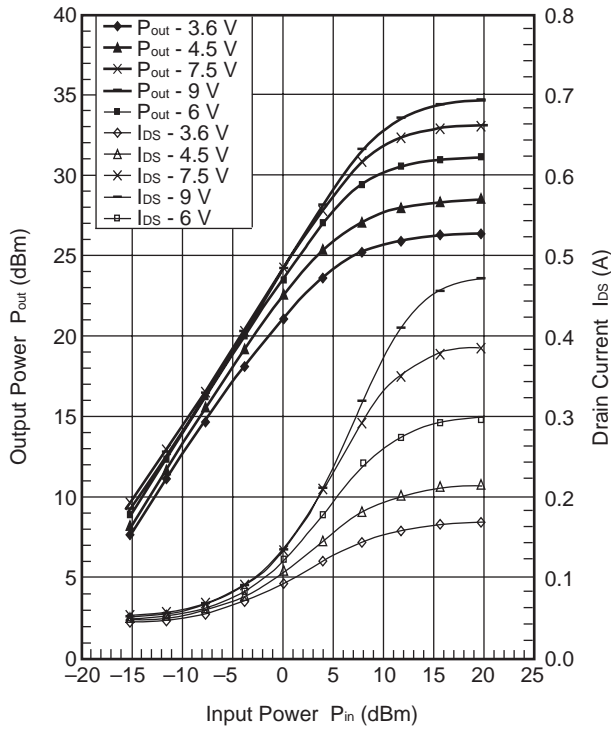


**TYPICAL CHARACTERISTICS 1 (T<sub>A</sub> = 25°C)**

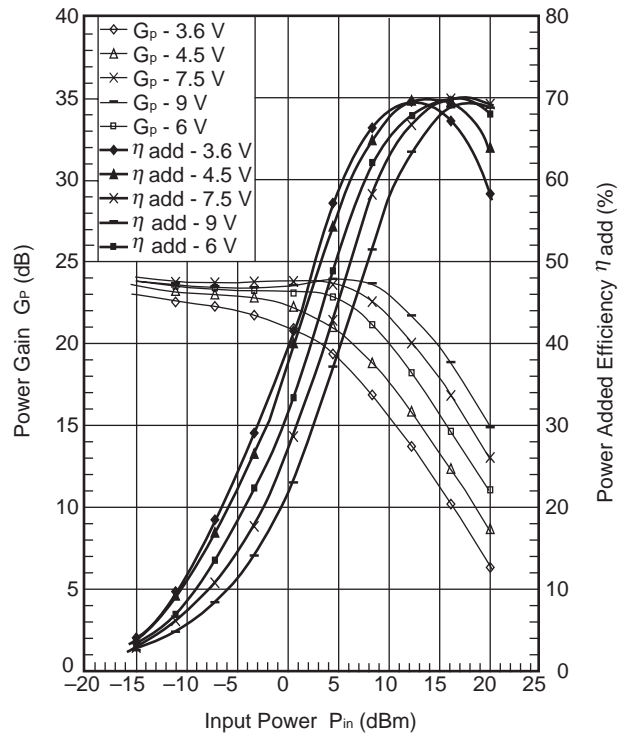
**RF: f = 460MHz, V<sub>DS</sub> = 3.6/4.5/6/7.5/9 V, I<sub>Dset</sub> = 40 mA, P<sub>in</sub> = -15 to 20 dBm**

**IM: f1 = 460MHz, f2 = 461 MHz, V<sub>DS</sub> = 3.6/4.5/6/7.5/9 V, I<sub>Dset</sub> = 40mA, P<sub>out</sub> (2 tone) = 6 to 28 dBm**

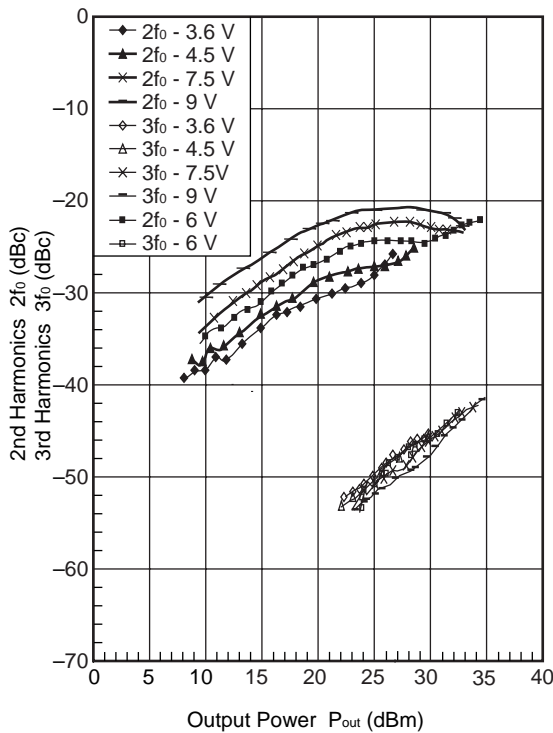
**OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER**



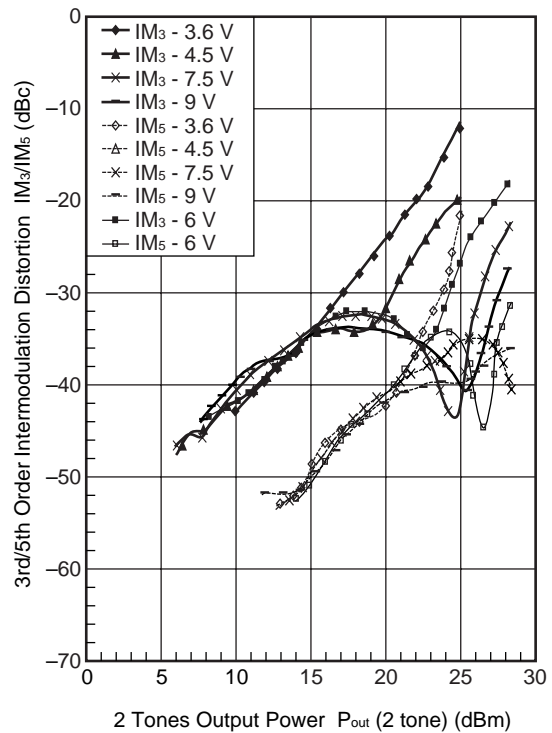
**POWER GAIN, POWER ADDED EFFICIENCY vs. INPUT POWER**



**2f<sub>0</sub>, 3f<sub>0</sub> vs. OUTPUT POWER**

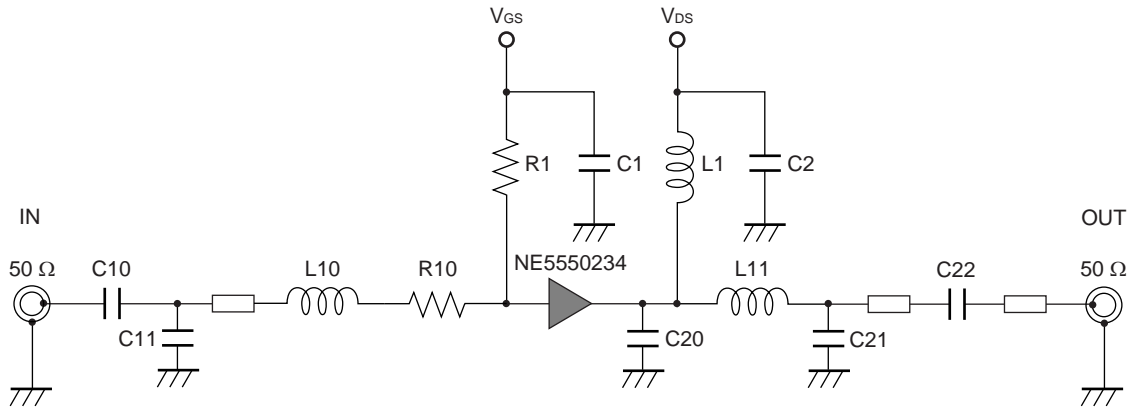


**IM<sub>3</sub>/IM<sub>5</sub> vs. 2 TONES OUTPUT POWER**



**Remark** The graphs indicate nominal characteristics.

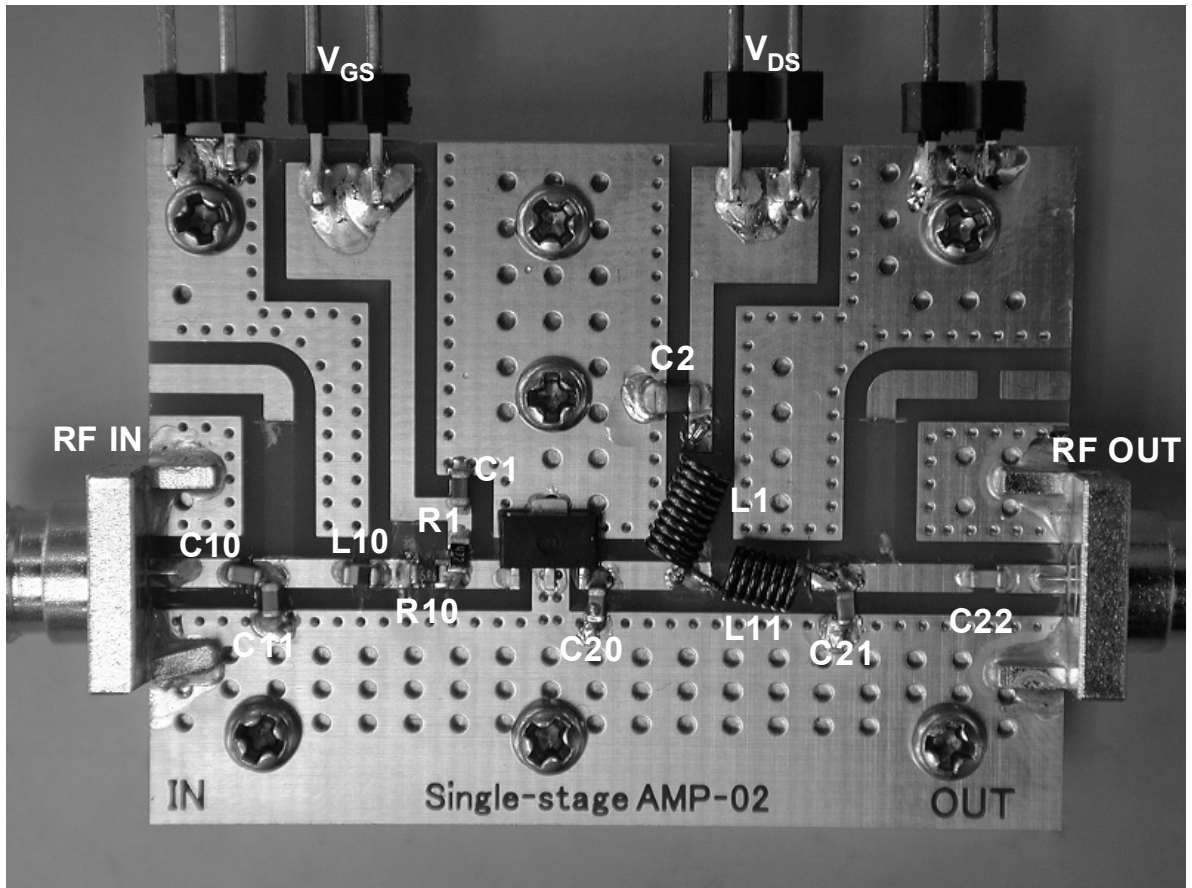
## TEST CIRCUIT SCHEMATIC FOR 157 MHz



## COMPONENTS OF TEST CIRCUIT FOR MEASURING ELECTRICAL CHARACTERISTICS

Symbol	Value	Type	Maker
C10	27 pF	GQM1882C1H270JB01	Murata
C11	6.8 pF	GQM1882C1H6R8DB01	Murata
C20	8.2 pF	GQM1882C1H8R2DB01	Murata
C21	27 pF	GQM1882C1H270JB01	Murata
C22	100 pF	GQM1882C1H101JB01	Murata
C1	1 $\mu$ F	GRM21BB31H105KA2L	Murata
C2	1 $\mu$ F	GRM21BB31H105KA2L	Murata
L10	100 nH	LL1608-FSLR10J	Toko
L11	47 nH	D20-47N2	Ohesangyou
L1	74 nH	D20-74N7	Ohesangyou
<R> R10	5.6 $\Omega$	MCR03J5R6	Rohm
R1	4.7 k $\Omega$	MCR03J472	Rohm
<R> PCB	–	R1766, t = 0.8 mm, $\epsilon$ = 4.8, size = 30 $\times$ 40 mm	Panasonic
SMA Connector	–	WAKA 01K0790-20	WAKA

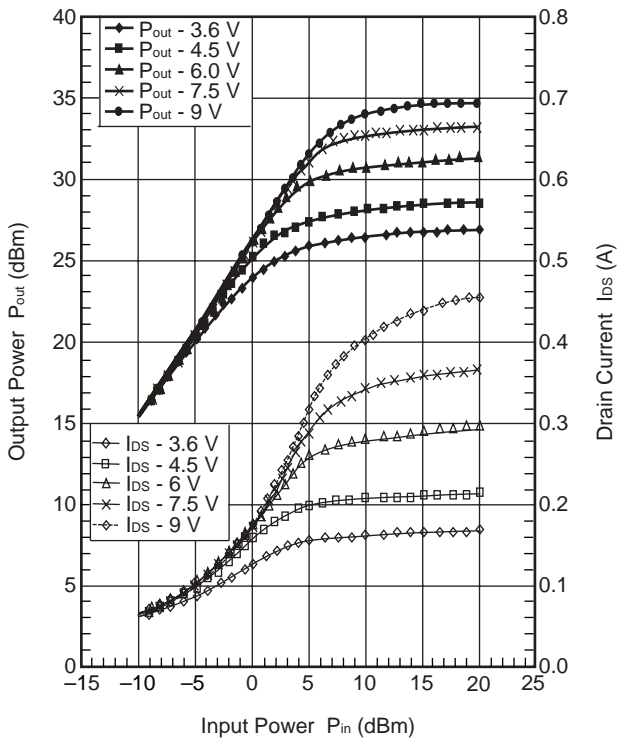
COMPONENT LAYOUT OF TEST CIRCUIT FOR 157 MHz



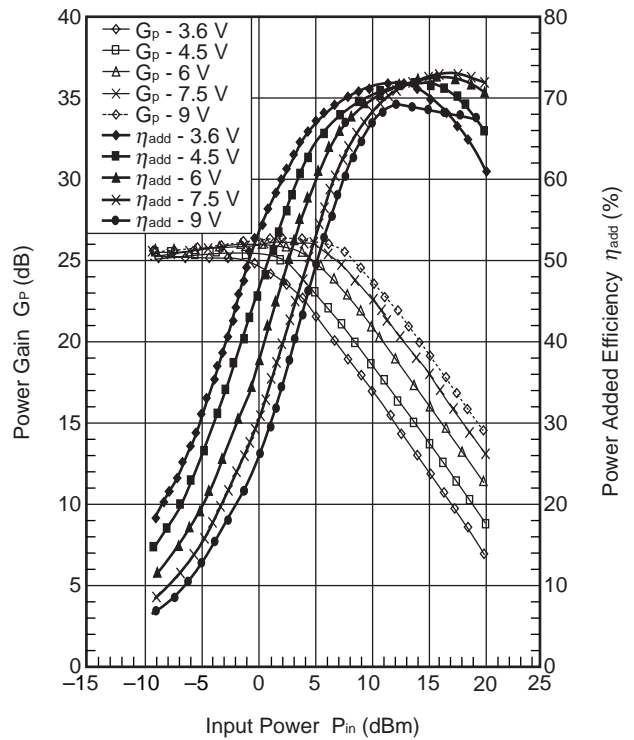
TYPICAL CHARACTERISTICS 2 ( $T_A = 25^\circ\text{C}$ )

RF:  $f = 157\text{ MHz}$ ,  $V_{DS} = 3.6/4.5/6/7.5/9\text{ V}$ ,  $I_{Dset} = 40\text{ mA}$ ,  $P_{in} = -10\text{ to }20\text{ dBm}$

OUTPUT POWER, DRAIN CURRENT vs. INPUT POWER

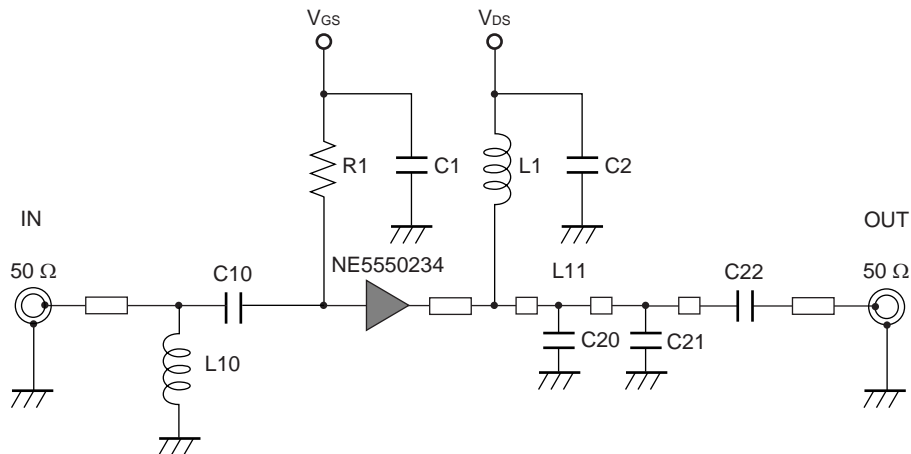


POWER GAIN, POWER ADDED EFFICIENCY vs. INPUT POWER



**Remark** The graphs indicate nominal characteristics.

## TEST CIRCUIT SCHEMATIC FOR 900 MHz

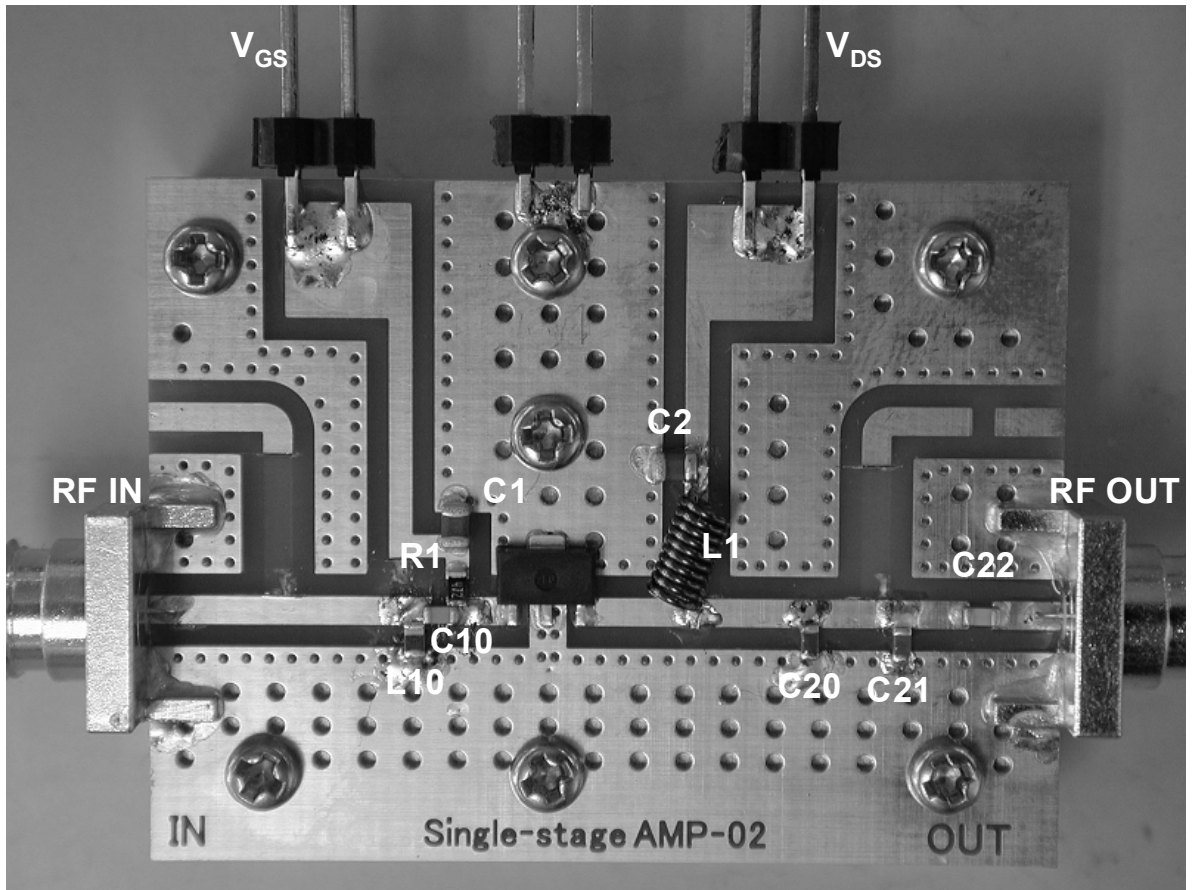


## COMPONENTS OF TEST CIRCUIT FOR MEASURING ELECTRICAL CHARACTERISTICS

Symbol	Value	Type	Maker
C10	10 pF	GQM1882C1H100JB01	Murata
C20	6.8 pF	GQM1882C1H6R8DB01	Murata
C21	1 pF	GQM1884C2A1R0CB01	Murata
C22	100 pF	GQM1882C1H101JB01	Murata
C1	1 $\mu$ F	GRM21BB31H105KA2L	Murata
C2	1 $\mu$ F	GRM21BB31H105KA2L	Murata
L10	2.7 nH	LL1608-FSL2N7S	Toko
L1	74 nH	D20-74N7	Ohesangyou
R1	4.7 k $\Omega$	MCR03J472	Rohm
<R> PCB	-	R1766, t = 0.8 mm, $\epsilon$ r = 4.8, size = 30 $\times$ 40 mm	Panasonic
SMA Connector	-	WAKA 01K0790-20	WAKA



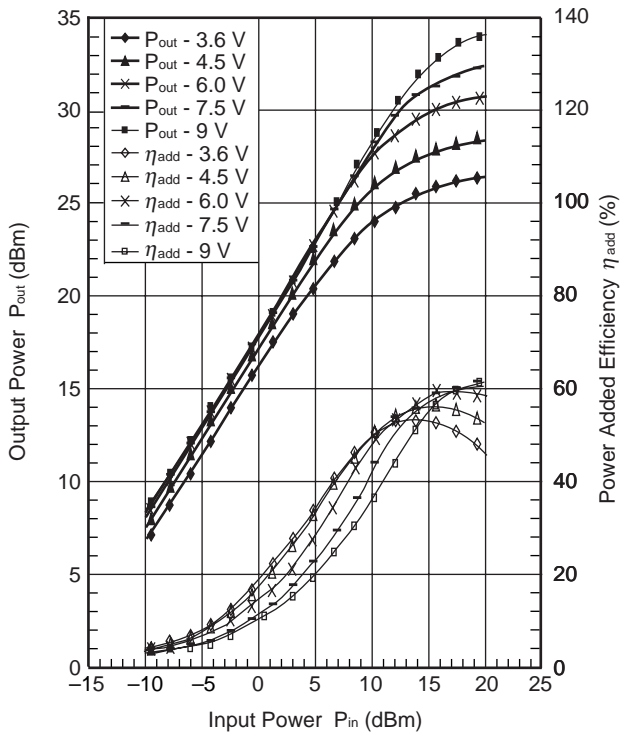
COMPONENT LAYOUT OF TEST CIRCUIT FOR 900 MHz



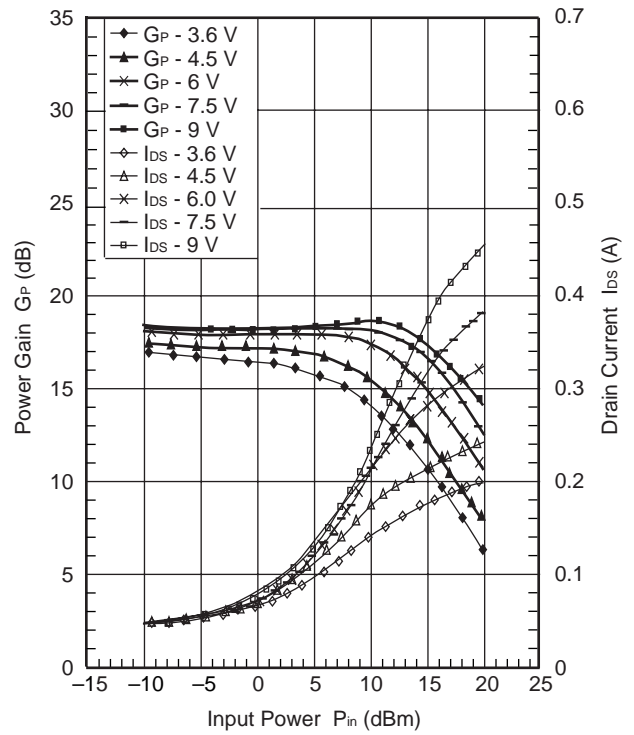
**TYPICAL CHARACTERISTICS 3 (T<sub>A</sub> = 25°C)**

**RF: f = 900 MHz, V<sub>DS</sub> = 3.6/4.5/6/7.5/9 V, I<sub>Dset</sub> = 40 mA, P<sub>in</sub> = -10 to 20 dBm**

**OUTPUT POWER, POWER ADDED EFFICIENCY vs. INPUT POWER**



**POWER GAIN, DRAIN CURRENT vs. INPUT POWER**



**Remark** The graphs indicate nominal characteristics.

## S-PARAMETERS

S-parameters and noise parameters are provided on our web site in a form (S2P) that enables direct import of the parameters to microwave circuit simulators without the need for keyboard inputs.

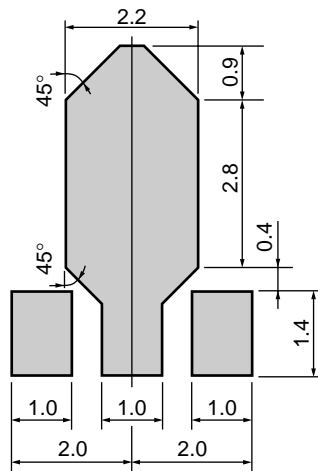
Click here to download S-parameters.

[Products] → [RF Devices] → [Device Parameters]

URL <http://www.renesas.com/products/microwave/>

## MOUNTING PAD LAYOUT DIMENSIONS

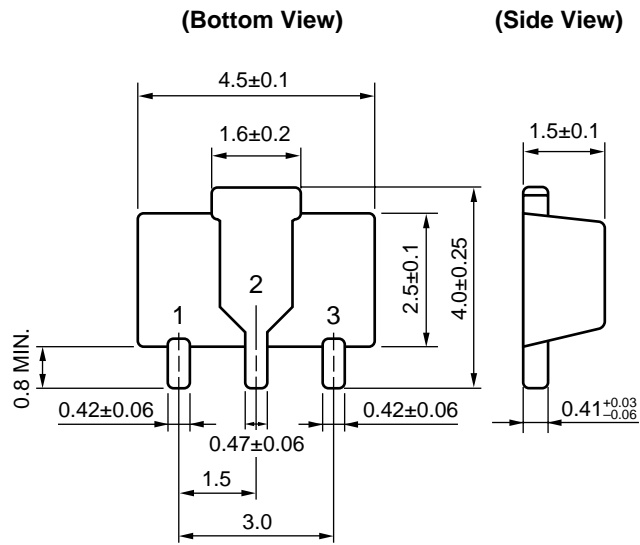
3-PIN POWER MINIMOLD (34 PKG) (UNIT: mm)



**Remark** The mounting pad layout in this document is for reference only.  
When designing PCB, please consider workability of mounting, solder joint reliability, prevention of solder bridge and so on, in order to optimize the design.

**PACKAGE DIMENSIONS**

**3-PIN POWER MINIMOLD (34 PKG) (UNIT: mm)**



**PIN CONNECTIONS**

- 1. Drain
- 2. Source
- 3. Gate

**RECOMMENDED SOLDERING CONDITIONS**

This product should be soldered and mounted under the following recommended conditions. For soldering methods and conditions other than those recommended below, contact your nearby sales office.

<b>Soldering Method</b>	<b>Soldering Conditions</b>	<b>Condition Symbol</b>
Infrared Reflow	Peak temperature (package surface temperature) : 260°C or below Time at peak temperature : 10 seconds or less Time at temperature of 220°C or higher : 60 seconds or less Preheating time at 120 to 180°C : 120±30 seconds Maximum number of reflow processes : 3 times Maximum chlorine content of rosin flux (% mass) : 0.2% (Wt.) or below	IR260
Wave Soldering	Peak temperature (molten solder temperature) : 260°C or below Time at peak temperature : 10 seconds or less Preheating temperature (package surface temperature) : 120°C or below Maximum number of flow processes : 1 time Maximum chlorine content of rosin flux (% mass) : 0.2% (Wt.) or below	WS260
Partial Heating	Peak temperature (terminal temperature) : 350°C or below Soldering time (per side of device) : 3 seconds or less Maximum chlorine content of rosin flux (% mass) : 0.2% (Wt.) or below	HS350

**CAUTION**

Do not use different soldering methods together (except for partial heating).

**Revision History****NE5550234 Data Sheet**

Rev.	Date	Description	
		Page	Summary
1.00	Apr 25, 2012	–	First edition issued
2.00	Jul 04, 2012	p.2	Modification of ELECTRICAL CHARACTERISTICS
3.00	Mar 12, 2013	P3	Modification of COMPONENTS OF TEST CIRCUIT FOR MEASURING ELECTRICAL CHARACTERISTICS
		P5	Modification of TEST CIRCUIT SCHEMATIC FOR 157 MHz
		P8	Modification of COMPONENTS OF TEST CIRCUIT FOR MEASURING ELECTRICAL CHARACTERISTICS

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**California Eastern Laboratories, Inc.**  
4590 Patrick Henry Drive, Santa Clara, California 95054, U.S.A.  
Tel: +1-408-919-2500, Fax: +1-408-988-0279

**Renesas Electronics Europe Limited**  
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K  
Tel: +44-1628-651-700, Fax: +44-1628-651-804

**Renesas Electronics Europe GmbH**  
Arcadiastrasse 10, 40472 Düsseldorf, Germany  
Tel: +49-211-65030, Fax: +49-211-6503-1327

**Renesas Electronics (China) Co., Ltd.**  
7th Floor, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100083, P.R.China  
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

**Renesas Electronics (Shanghai) Co., Ltd.**  
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd., Pudong District, Shanghai 200120, China  
Tel: +86-21-5877-1818, Fax: +86-21-6887-7858 / -7898

**Renesas Electronics Hong Kong Limited**  
Unit 1601-1613, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong  
Tel: +852-2886-9318, Fax: +852 2886-9022/9044

**Renesas Electronics Taiwan Co., Ltd.**  
13F, No. 363, Fu Shing North Road, Taipei, Taiwan  
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

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Tel: +82-2-558-3737, Fax: +82-2-558-5141