

## PRELIMINARY DATA SHEET

# NEC

### Si LDMOSFET ANALOG RF INTEGRATED CIRCUIT

# $\mu$ PD5702TU

## 3V OPERATION SILICON LDMOSFET RF POWER AMPLIFIER INTEGRATED CIRCUIT FOR 1.9 GHz PHS AND 2.4 GHz APPLICATIONS

### DESCRIPTION

The  $\mu$ PD5702TU is a silicon laterally diffused (LD) MOSFET IC designed for use as power amplifier 1.9 GHz PHS and 2.4 GHz applications. This IC consists of two stage amplifiers. The device is packaged in surface mount 8 pin L2MM (Lead Less Mini Mold) plastic package.

### FEATURES

- Output Power :  $P_{out} = +21$  dBm MIN. @  $P_{in} = -5$  dBm,  $f = 1.9$  GHz,  $V_{DS} = 3.0$  V  
:  $P_{out} = +21$  dBm MIN. @  $P_{in} = +2$  dBm,  $f = 2.45$  GHz,  $V_{DS} = 3.0$  V
- Single Supply voltage :  $V_{DS} = 3.0$  V TYP.
- Packaged in 8-pin Lead-Less Minimold (2.0 x 2.2 x 0.5mm) suitable for high-density surface mounting.

### APPLICATIONS

- 1.9 GHz applications (Example : PHS etc.)
- 2.4 GHz applications (Example : Wireless LAN etc.)

### ORDERING INFORMATION

Part Number	Package	Marking	Supplying Form
$\mu$ PD5702TU-E2	8-pin Lead-Less Minimold	5702	<ul style="list-style-type: none"><li>8 mm wide embossed taping</li><li>Pin 5, 6, 7, 8 indicates pull-out direction of tape</li><li>Qty 5 kpcs/reel</li></ul>

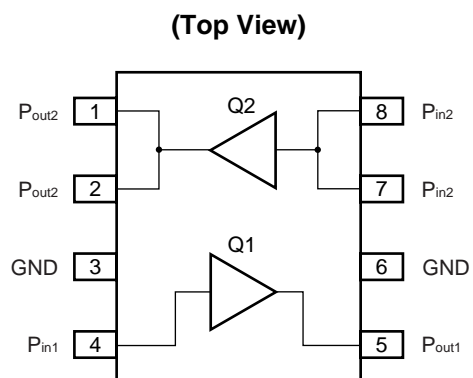
**Remark** To order evaluation samples, contact your nearby sales office.

Part number for sample order:  $\mu$ PD5702TU

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

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Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

PIN CONNECTION AND INTERNAL BLOCK DIAGRAM



# ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Test Conditions	Ratings	Unit
Drain to Source Voltage	$V_{DS}$	$T_A = +25^{\circ}\text{C}$	8.0	V
Gate to Source Voltage	$V_{GS}$	$T_A = +25^{\circ}\text{C}$	8.0	V
Drain Current of Q1	$I_{ds1}$	$T_A = +25^{\circ}\text{C}$	45	mA
Drain Current of Q2	$I_{ds2}$	$T_A = +25^{\circ}\text{C}$	259	mA
Total Power Dissipation	$P_D$	$T_A = +85^{\circ}\text{C}$ <b>Note</b>	4.33	W
Channel Temperature	$T_{ch}$		150	$^{\circ}\text{C}$
Storage Temperature	$T_{stg}$		-65 to +150	$^{\circ}\text{C}$
Operating Ambient Temperature	$T_A$		-40 to +85	$^{\circ}\text{C}$
Maximum Input Power to Q1	$P_{in1}$	$T_A = +25^{\circ}\text{C}$	6	dBm
Maximum Input Power to Q2	$P_{in2}$	$T_A = +25^{\circ}\text{C}$	16	dBm

**Note** Mounted on 33 × 21 mm epoxy glass PWB

# RECOMMENDED OPERATING RANGE

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	$V_{DS}$	$T_A = +25^{\circ}\text{C}$	2.7	3.0	3.5	V
Gate to Source Voltage	$V_{GS}$	$T_A = +25^{\circ}\text{C}$	0	2.0	2.5	V
Maximum Input Power to Q1	$P_{in1}$	$V_{DS} = 3\text{V}, T_A = +25^{\circ}\text{C}$		2.0	5.0	dBm
Maximum Input Power to Q2	$P_{in2}$	$V_{DS} = 3\text{V}, T_A = +25^{\circ}\text{C}$		11.0	15.0	dBm

# ELECTRICAL CHARACTERISTICS

( $f = 1.9\text{ GHz}$ ,  $V_{DS} = 3.0\text{ V}$ ,  $T_A = +25^{\circ}\text{C}$ , unless otherwise specified, using our standard test fixture.)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Gate to Source Voltage	$V_{GS}$	$P_{in} = -5\text{ dBm}$	1.0	1.9	2.5	V
Power Added Efficiency	PAE	$P_{out} = +21.0\text{ dBm}$	—	28.0	—	%
Drain Current	$I_{DS}^{\text{Note}}$		—	155	230	mA
Input Return Loss	IRL	$P_{in} = -20\text{ dBm}$	—	10	—	dB
Output Return Loss	ORL		—	8	—	dB
Output Power	$P_{out}$	$P_{in} = -5\text{ dBm}$	21.0	—	—	dBm
Power Gain	$G_P$		26.0	—	—	dB
Linear Gain	$G_L$	$P_{in} = -20\text{ dBm}$	—	26.5	—	dB
Adjacent Channel Power Leakage 1	$P_{adj1}$	$P_{in} = -5\text{ dBm}, \Delta 600\text{ kHz}$	—	-60.0	-55.0	dBc
Adjacent Channel Power Leakage 2	$P_{adj2}$	$P_{in} = -5\text{ dBm}, \Delta 900\text{ kHz}$	—	-70.0	-60	dBc
Occupied Band Width	OBW	$P_{in} = -5\text{ dBm}$	—	250	—	kHz

**Note**  $I_{DS}$  is total Drain currents of Q1 and Q2 part.

# ELECTRICAL CHARACTERISTICS

(f = 2.4 GHz, T<sub>A</sub> = +25°C, unless otherwise specified, using our standard test fixture.)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
V <sub>DS</sub> = 3.3 V						
Gate to Source Voltage	V <sub>GS</sub>	P <sub>in</sub> = +2 dBm P <sub>out</sub> = +22.0 dBm	–	1.9	–	V
Power Added Efficiency	PAE		–	28.0	–	%
Drain Current	I <sub>DS</sub> <sup>Note</sup>		–	180	–	mA
Input Return Loss	IRL	P <sub>in</sub> = –20 dBm	–	10	–	dB
Output Return Loss	ORL		–	10	–	dB
Output Power	P <sub>out</sub>	P <sub>in</sub> = +2 dBm	22.0	–	–	dBm
Power Gain	G <sub>P</sub>		20.0	–	–	dB
V <sub>DS</sub> = 3.0 V						
Gate to Source Voltage	V <sub>GS</sub>	P <sub>in</sub> = +2 dBm P <sub>out</sub> = +21.0 dBm	–	1.9	–	V
Power Added Efficiency	PAE		–	27.5	–	%
Drain Current	I <sub>DS</sub> <sup>Note</sup>		–	150	–	mA
Input Return Loss	IRL	P <sub>in</sub> = –20 dBm	–	10	–	dB
Output Return Loss	ORL		–	10	–	dB
Output Power	P <sub>out</sub>	P <sub>in</sub> = +2 dBm	21.0	–	–	dBm
Power Gain	G <sub>P</sub>		19.0	–	–	dB

**Note** I<sub>DS</sub> is total Drain currents of Q1 and Q2 part.

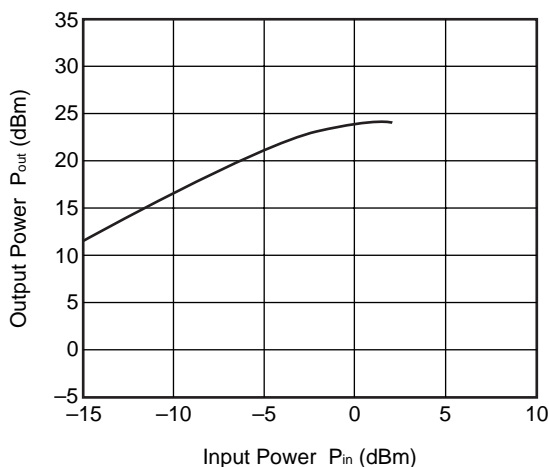
## DC CHARACTERISTICS (T<sub>A</sub> = +25°C)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Q1						
On-state Resistance1	R <sub>on1</sub>	V <sub>DS</sub> = 0.1 V, V <sub>GS</sub> = 6 V	–	4.35	–	Ω
Drain to Source Breakdown Voltage1	BV <sub>DSS1</sub>	I <sub>DS</sub> = 1.4 μA	10.0	–	–	V
Gate to Source Breakdown Voltage1	BV <sub>GSS1</sub>	I <sub>GS</sub> = 1.4 μA	4.0	–	–	V
Gate Threshold Voltage1	V <sub>th1</sub>	V <sub>DS</sub> = 3.5 V, I <sub>DS</sub> = 1.4 mA	1.15	1.40	1.65	V
Transconductance1	g <sub>m1</sub>	V <sub>DS</sub> = 3.5 V, I <sub>DS</sub> = 25 mA	50	70	–	mS
Q2						
On-state Resistance2	R <sub>on2</sub>	V <sub>DS</sub> = 0.1 V, V <sub>GS</sub> = 6 V	–	1.02	–	Ω
Drain to Source Breakdown Voltage2	BV <sub>DSS2</sub>	I <sub>DS</sub> = 8.0 μA	10.0	–	–	V
Gate to Source Breakdown Voltage2	BV <sub>GSS2</sub>	I <sub>GS</sub> = 8.0 μA	4.0	–	–	V
Gate Threshold Voltage2	V <sub>th2</sub>	V <sub>DS</sub> = 3.5 V, I <sub>DS</sub> = 8.0 mA	1.15	1.40	1.65	V
Transconductance2	g <sub>m2</sub>	V <sub>DS</sub> = 3.5 V, I <sub>DS</sub> = 150 mA	290	370	–	mS

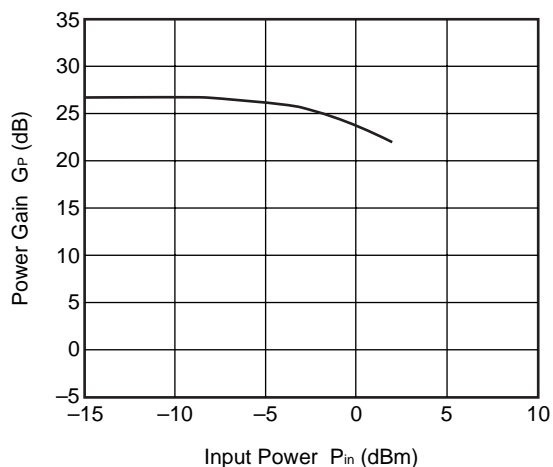
# **TYPICAL CHARACTERISTICS (Preliminary)**

( $f = 1.9 \text{ GHz}$ ,  $V_{DS} = 3 \text{ V}$ ,  $V_{GS} = 2 \text{ V}$ ,  $T_A = +25^\circ\text{C}$ , unless otherwise specified)

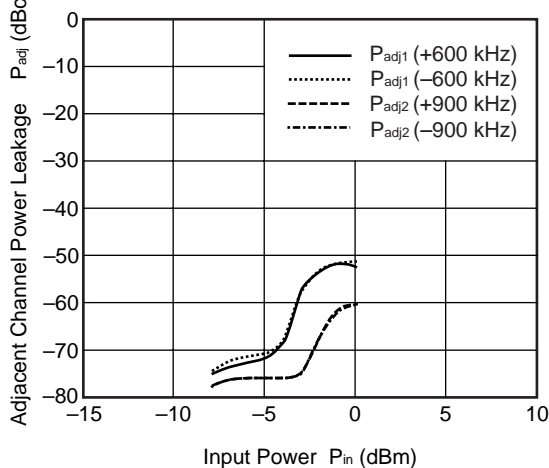
OUTPUT POWER vs. INPUT POWER



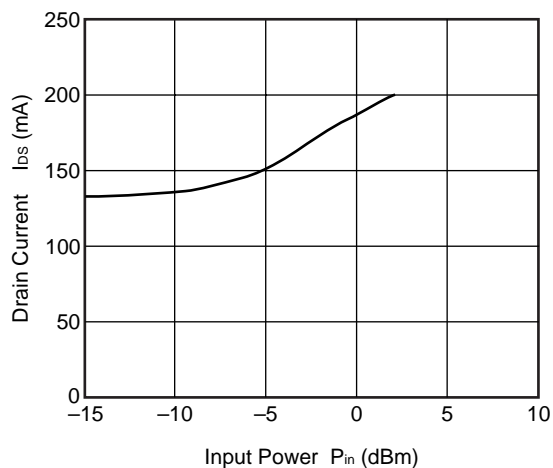
POWER GAIN vs. INPUT POWER



$P_{adj}$  vs. INPUT POWER



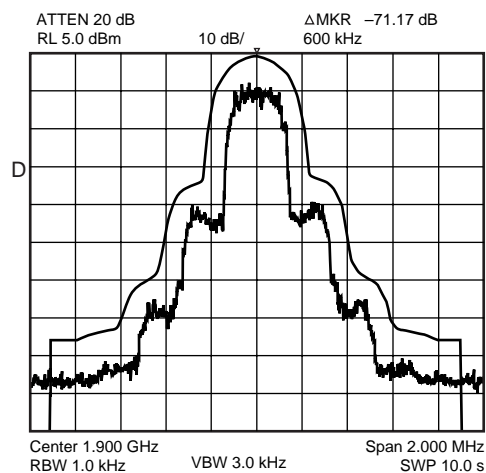
DRAIN CURRENT vs. INPUT POWER



**Remark** The graphs indicate nominal characteristics.

# ADJACENT CHANNEL POWER

( $f = 1.9 \text{ GHz}$ ,  $V_{DS} = 3 \text{ V}$ ,  $P_{in} = -5 \text{ dBm}$ ,  $T_A = +25^\circ\text{C}$ , unless otherwise specified)

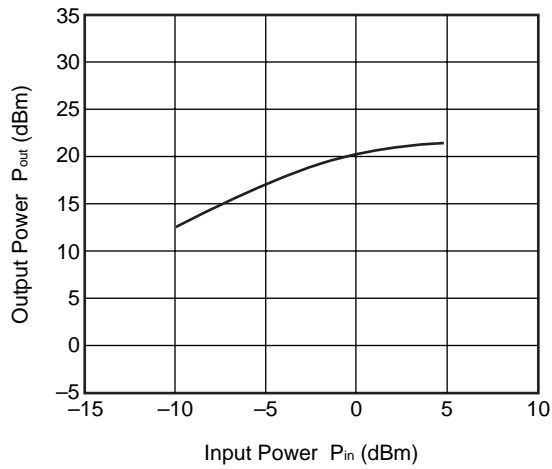


**Remark** The graphs indicate nominal characteristics.

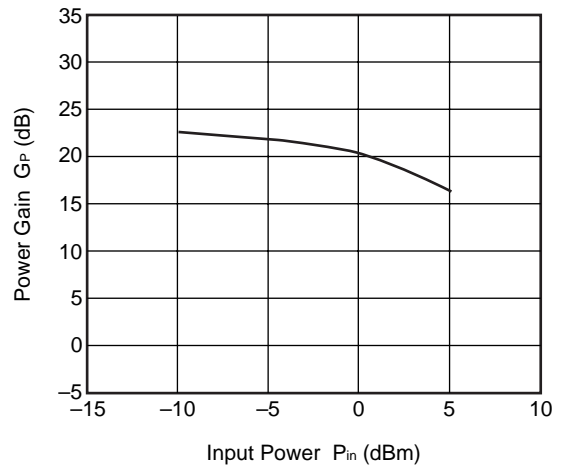
# **TYPICAL CHARACTERISTICS (Preliminary)**

( $f = 2.4 \text{ GHz}$ ,  $V_{DS} = 3 \text{ V}$ ,  $V_{GS} = 2 \text{ V}$ ,  $T_A = +25^\circ\text{C}$ , unless otherwise specified)

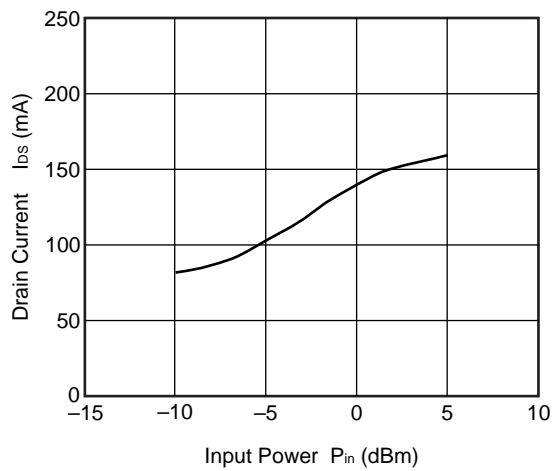
OUTPUT POWER vs. INPUT POWER



POWER GAIN vs. INPUT POWER



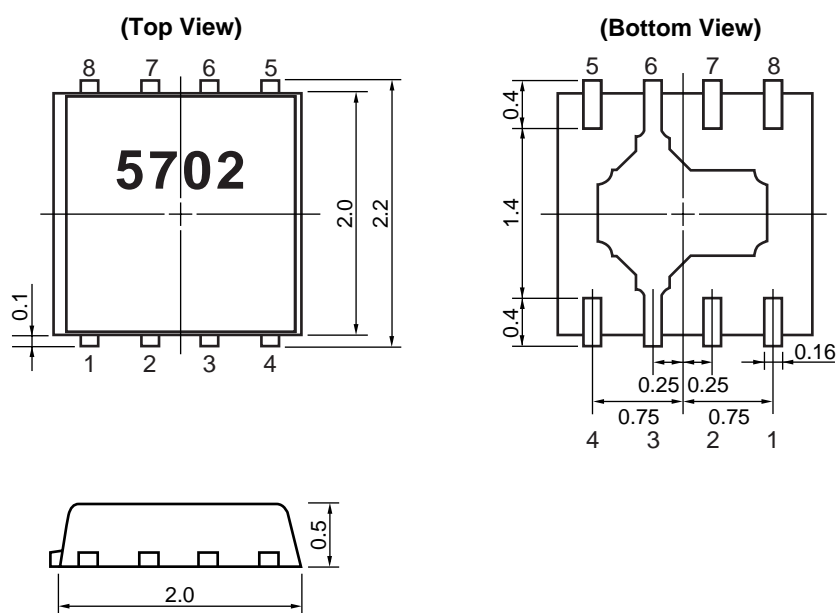
DRAIN CURRENT vs. INPUT POWER



**Remark** The graphs indicate nominal characteristics.

# PACKAGE DIMENSIONS

8-PIN LEAD-LESS MINIMOLD (UNIT: mm)





# 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.

Soldering Method	Soldering Conditions	Condition Symbol
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
VPS	Peak temperature (package surface temperature) : 215°C or below Time at temperature of 200°C or higher : 25 to 40 seconds Preheating time at 120 to 150°C : 30 to 60 seconds Maximum number of reflow processes : 3 times Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	VP215
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 (pin 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).

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