

To our customers,

Old Company Name in Catalogs and Other Documents

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Renesas Electronics website: <http://www.renesas.com>

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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Not recommended
for new design

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LDMOS FIELD EFFECT TRANSISTOR

NEM091603P-28

N-CHANNEL SILICON POWER LDMOS FET FOR 160 W UHF-BAND SINGLE-END POWER AMPLIFIER

DESCRIPTION

The NEM091603P-28 is an N-channel enhancement-mode lateral diffused MOS FET designed for 800 to 1 000 MHz applications, such as, GSM/EDGE/N-CDMA/W-CDMA/cdma2000 cellular base station. Dies are manufactured using our NEWMOS technology (our WSi gate lateral MOS FET), and its nitride surface passivation and multi layer aluminum silicon metallization offer a high degree of reliability.

FEATURES

- High 1 dB compression output power : $P_{O(1\text{ dB})} = 160\text{ W TYP.}$ ($V_{DS} = 28\text{ V}$, $I_{Dset} = 1\ 200\text{ mA}$, $f = 860\text{ to }880\text{ MHz CW}$)
- High linear gain : $G_L = 19.5\text{ dB TYP.}$ ($V_{DS} = 28\text{ V}$, $I_{Dset} = 1\ 200\text{ mA}$, $f = 860\text{ to }880\text{ MHz CW}$)
- High drain efficiency : $\eta_d = 60\% \text{ TYP.}$ ($V_{DS} = 28\text{ V}$, $I_{Dset} = 1\ 200\text{ mA}$, $f = 860\text{ to }880\text{ MHz CW}$)
- Low intermodulation distortion : $IM_3 = -40\text{ dBc TYP.}$ ($V_{DS} = 28\text{ V}$, $I_{Dset} = 1\ 200\text{ mA}$, $f = 880/880.1\text{ MHz}$, $P_{out} = 46.5\text{ dBm (2 tones)}$)
: $IM_3 = -40\text{ dBc TYP.}$ ($V_{DS} = 28\text{ V}$, $I_{Dset} = 1\ 200\text{ mA}$, $f = 960/960.1\text{ MHz}$, $P_{out} = 46.0\text{ dBm (2 tones)}$)
- Internal matched (Input and Output) for ease of use
- Low cost hollow plastic packages
- 100% screening
- Integrated ESD protection
- Effective prevention against humidity
- Excellent stability against HCI (Hot Carrier Injection)

APPLICATION

- Digital cellular base station PA : GSM/EDGE/N-CDMA/W-CDMA/cdma2000 etc.

ORDERING INFORMATION

Part Number	Order Number	Package	Supplying Form
NEM091603P-28	NEM091603P-28-A	T-97M (3P) (Pb-Free)	ESD protective envelope

Remark To order evaluation samples, contact your nearby sales office.
The unit sample quantity is 1 pcs.

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

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ABSOLUTE MAXIMUM RATINGS (T_A = +25°C, unless otherwise specified)

Parameter	Symbol	Ratings	Unit
Drain to Source Voltage	V _{DS}	65	V
Gate to Source Voltage	V _{GS}	±7	V
Drain Current	I _D	12	A
Total Device Dissipation	P _{tot}	318	W
Channel Temperature	T _{ch}	200	°C
Storage Temperature	T _{stg}	-65 to +150	°C

THERMAL RESISTANCE (T_A = +25°C)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Thermal Resistance (Channel to case)	R _{th (ch-c)}		-	0.48	0.55	°C/W

RECOMMENDED OPERATING RANGE

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V _{DS}	-	28	32	V
Gate to Source Voltage	V _{GS}	1.9	2.4	2.9	V
Average Input Power	P _{in (ave.)}	-	28	35	dBm

Not recommended for new design

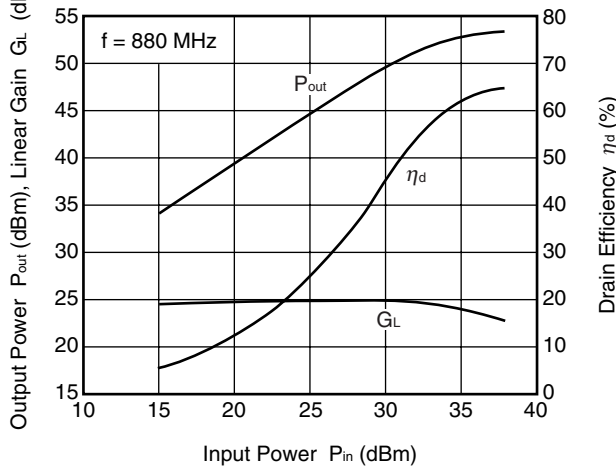
ELECTRICAL CHARACTERISTICS (T_A = +25°C)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
DC Characteristics						
Gate to Source Leak Current	I _{GSS}	V _{GSS} = 5 V	–	–	1	μA
Drain to Source Leakage Current (Zero Gate Voltage Drain Current)	I _{DSS}	V _{DSS} = 65 V	–	–	1	mA
Gate Threshold Voltage	V _{th}	V _{DS} = 10 V, I _{DS} = 1 mA	1.1	1.6	2.1	V
Transconductance	g _m	V _{DS} = 8.1 V, I _{DS} = 2±0.1 A	–	5.0	–	S
Drain to Source Breakdown Voltage	BV _{DSS}	I _{DSS} = 200 μA	65	75	–	V
RF Characteristics						
Output Power	P _{out}	f = 860 to 880 MHz, P _{in} = 35 dBm,	51.8	52.3	–	dBm
Gain 1 dB Compression Output Power	P _{O(1 dB)}	V _{DS} = 28 V, I _{Dset} = 1 200 mA	–	52.0	–	dBm
Drain Efficiency	η _d		52	60	–	%
Power Added Efficiency	η _{add}		–	59	–	%
Linear Gain	G _L ^{Note}		18.0	19.5	–	dB
3rd Order Intermodulation Distortion	IM ₃		f = 880/880.1 MHz, V _{DS} = 28 V, I _{Dset} = 1 200 mA, 2 tones P _{out} = 46.5 dBm	–	–40	–
Output Power	P _{out}	f = 920 to 960 MHz, P _{in} = 35 dBm,	–	52.2	–	dBm
Gain 1 dB Compression Output Power	P _{O(1 dB)}	V _{DS} = 28 V, I _{Dset} = 1 200 mA	–	51.9	–	dBm
Drain Efficiency	η _d		–	58	–	%
Power Added Efficiency	η _{add}		–	57	–	%
Linear Gain	G _L ^{Note}		–	19.0	–	dB
3rd Order Intermodulation Distortion	IM ₃		f = 960/960.1 MHz, V _{DS} = 28 V, I _{Dset} = 1 200 mA, 2 tones P _{out} = 46 dBm	–	–40	–

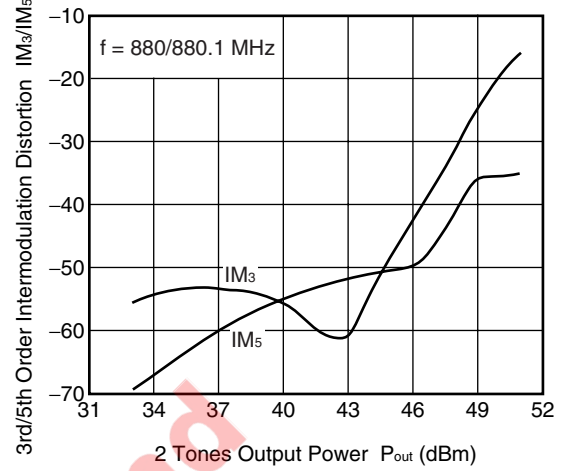
Note P_{in} = 28 dBm

TYPICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, $V_{DS} = 28\text{ V}$, $I_{Dset} = 1\ 200\text{ mA}$, unless otherwise specified)

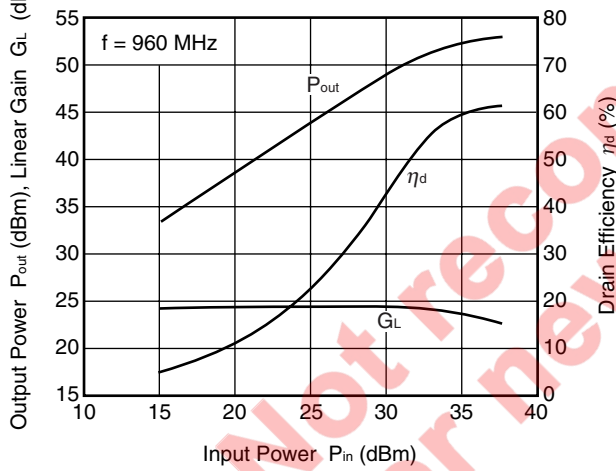
OUTPUT POWER, LINEAR GAIN, DRAIN EFFICIENCY vs. INPUT POWER



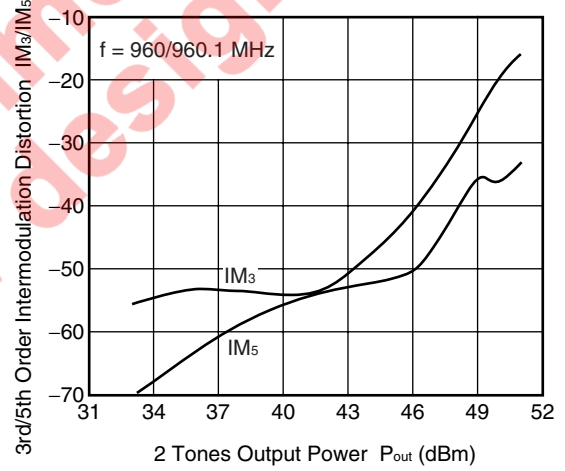
IM₃/IM₅ vs. 2 TONES OUTPUT POWER



OUTPUT POWER, LINEAR GAIN, DRAIN EFFICIENCY vs. INPUT POWER

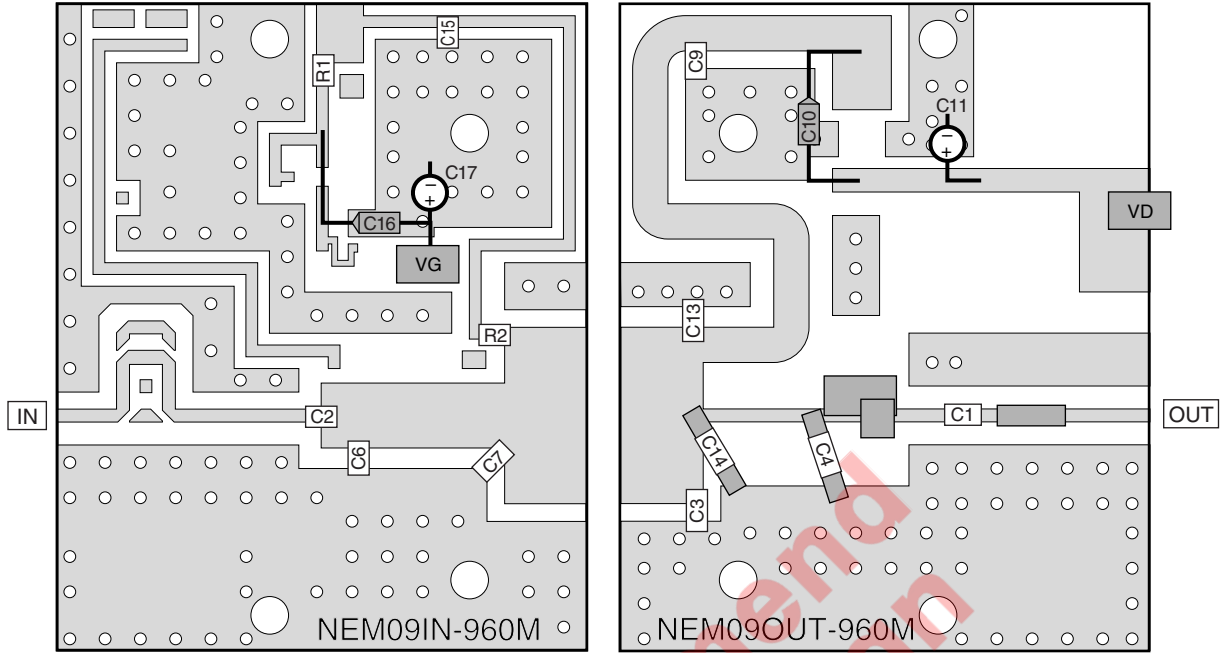


IM₃/IM₅ vs. 2 TONES OUTPUT POWER

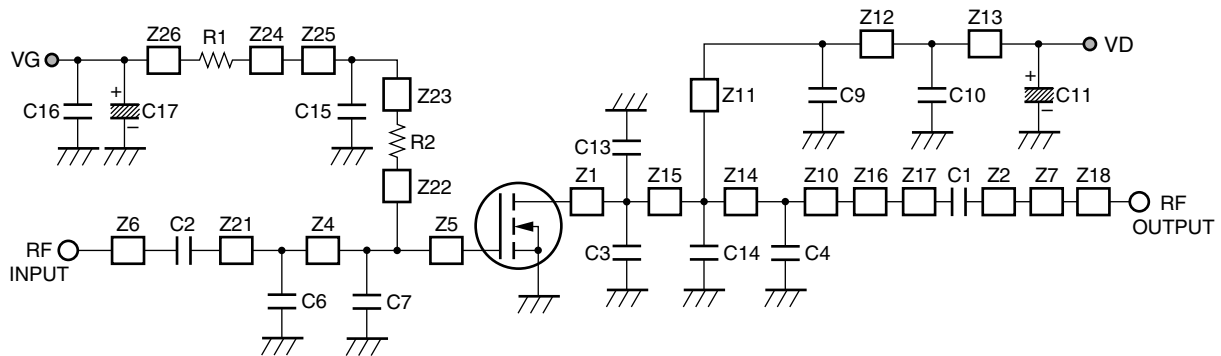


Remark The graphs indicate nominal characteristics.

COMPONENT LAYOUT OF TEST CIRCUIT FOR 860 TO 880 MHz



TEST CIRCUIT SCHMATIC FOR 860 TO 880 MHz



Symbol	Value	Symbol	Value
C1, C2	30 pF Chip Capacitor	Z25	Line, 1 × 6 mm
C4, C6	4 pF Chip Capacitor	Z24	Line, 5 × 4 mm
C7	7 pF Chip Capacitor	Z26	Line, 1 × 7 mm
C3, C14	8 pF Chip Capacitor	Z1	Line, 15 × 6 mm
C13	9 pF Chip Capacitor	Z15	Line, 15 × 1 mm
C9, C15	0.1 μF Chip Capacitor	Z14	Line, 1.1 × 10 mm
C10, C16	1 000 pF Feed-through Capacitor	Z10	Line, 2.5 × 2.5 mm
C11, C17	47 μF Electrolytic Capacitor	Z16	Line, 4.5 × 2.5 mm
R1	100 Ω Chip Resistor	Z17	Line, 1.1 × 6 mm
R2	10 Ω Chip Resistor	Z2	Line, 1.1 × 1 mm
Z6	Line, 1.1 × 30.7 mm	Z7	Line, 1.8 × 5 mm
Z21	Line, 5.5 × 2.6 mm	Z18	Line, 1.1 × 8 mm
Z4	Line, 5.5 × 13 mm	Z11	Line, 3 × 46 mm
Z5	Line, 15 × 7 mm	Z12	Line, 3 × 15 mm
Z22	Line, 1 × 1 mm	Z13	Line, 10 × 2 mm
Z23	Line, 1 × 45 mm	Circuit Board	Rogers 4350, $\epsilon_r = 3.55$, Thickness 0.51 mm

S-PARAMETERS

S-parameters/Noise parameters are provided on our web site in a form (S2P) that enables direct import to a microwave circuit simulator without keyboard input.

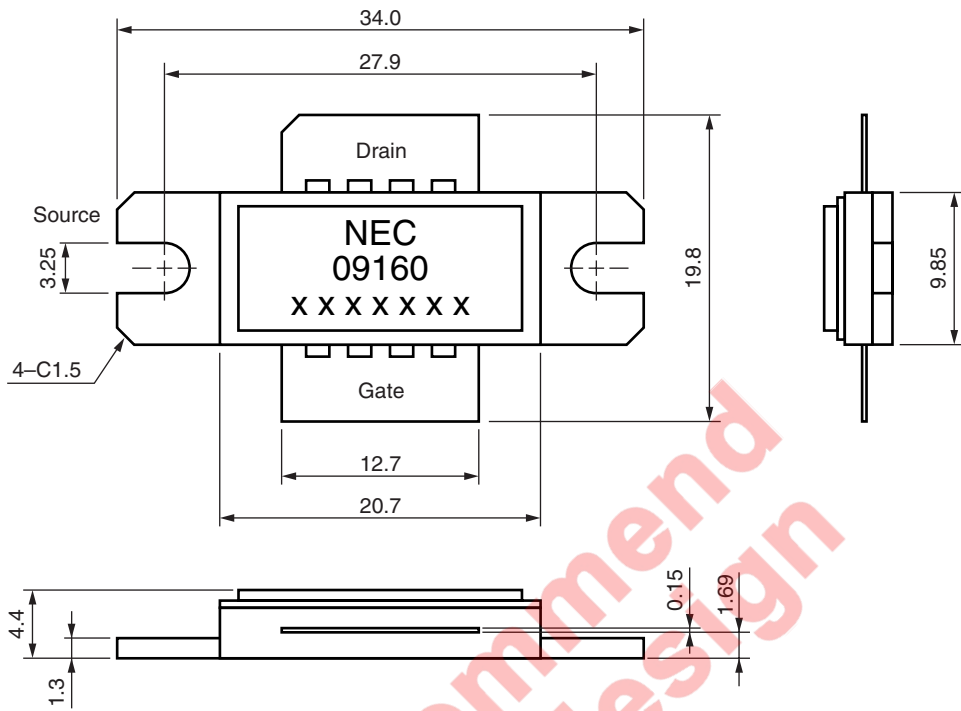
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[RF and Microwave] → [Device Parameters]

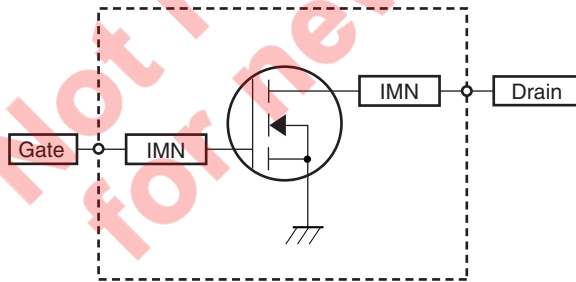
URL <http://www.ncsd.necel.com/microwave/index.html>

PACKAGE DIMENSIONS

T-97M (3P) (UNIT: mm)



Not recommend for new design



IMN : Internal Matching Network

RECOMMENDED MOUNTING CONDITIONS FOR CORRECT USE

- (1) Fix to a heat sink or mount surface completely with screws at the two holes of the flange.
- (2) The recommended torque strength of the screws is 53 N-cm typical using M3 type screws.
- (3) The recommended flatness of the mount surface is less than $\pm 10 \mu\text{m}$ (roughness of surface is $\nabla\nabla\nabla$).

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
Partial Heating	Peak temperature (terminal temperature) : 350°C or below Soldering time (per terminal of device) : 3 seconds or less Maximum chlorine content of rosin flux (% mass) : 0.2%(Wt.) or below	HS350-P3

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

Not recommended
 for new design

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