

# LDMOS FIELD EFFECT TRANSISTOR

## NEM090603M-28

### N-CHANNEL SILICON POWER LDMOS FET FOR 75 W UHF-BAND SINGLE-END POWER AMPLIFIER

#### DESCRIPTION

The NEM090603M-28 is an N-channel enhancement-mode lateral diffused MOS FET designed for driver or final stage in 0.8 to 1.0 GHz PA, such as, analog/digital TV-transmitter and GSM/EDGE/D-AMPS/PDC cellular base station amplifiers. Dies are manufactured using our NEWMOS technology (our WSi gate lateral MOS FET), and its nitride surface passivation and triple layer aluminum silicon metallization offer a high degree of reliability.

#### FEATURES

- High 1 dB compression output power :  $P_{O(1\text{ dB})} = 75\text{ W TYP.}$  ( $V_{DS} = 28\text{ V}$ ,  $I_{Dset} = 550\text{ mA}$ ,  $f = 960\text{ MHz}$ )
- High linear gain :  $G_L = 17.5\text{ dB TYP.}$  ( $V_{DS} = 28\text{ V}$ ,  $I_{Dset} = 550\text{ mA}$ ,  $f = 960\text{ MHz}$ )
- High drain efficiency :  $\eta_d = 54\% \text{ TYP.}$  ( $V_{DS} = 28\text{ V}$ ,  $I_{Dset} = 550\text{ mA}$ ,  $f = 960\text{ MHz}$ )
- Low intermodulation distortion :  $IM_3 = -31\text{ dBc TYP.}$  ( $V_{DS} = 28\text{ V}$ ,  $I_{Dset} = 550\text{ mA}$ ,  $f = 960/960.1\text{ MHz}$ ,  
 $P_{out} = 45\text{ dBm}$  (2 tones) )
- Excellent thermal stability
- Low cost hollow plastic packages
- Integrated ESD protection
- Excellent stability against HCI (Hot Carrier Injection)

#### APPLICATIONS

- Digital cellular base station PA : GSM/EDGE/D-AMPS/PDC/N-CDMA etc.
- UHF-band TV-transmitter PA

#### ORDERING INFORMATION

Part Number	Order Number	Package	Supplying Form
NEM090603M-28	NEM090603M-28-A	3M (T-91M) (Pb-Free)	ESD protective tray

**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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Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.

**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = +25°C, unless otherwise specified)**

Parameter	Symbol	Ratings	Unit
Drain to Source Voltage	V <sub>DS</sub>	65	V
Gate to Source Voltage	V <sub>GS</sub>	±7	V
Drain Current	I <sub>D</sub>	6	A
Total Device Dissipation	P <sub>D</sub> <sup>Note 1</sup>	146	W
Input Power	P <sub>in</sub> <sup>Note 2</sup>	3.0	W
Channel Temperature	T <sub>ch</sub>	200	°C
Storage Temperature	T <sub>stg</sub>	−65 to +150	°C

**Notes 1.** T<sub>C</sub> = 25°C

**2.** f = 960 MHz, V<sub>DS</sub> = 28 V

**RECOMMENDED OPERATING RANGE**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Drain to Source Voltage	V <sub>DS</sub>	−	28	30	V
Gate to Source Voltage	V <sub>GS</sub>	2.6	3.0	3.6	V
Average Input Power <sup>Note</sup>	P <sub>in</sub> (ave.)	−	28	32	dBm

**Note** f = 960 MHz

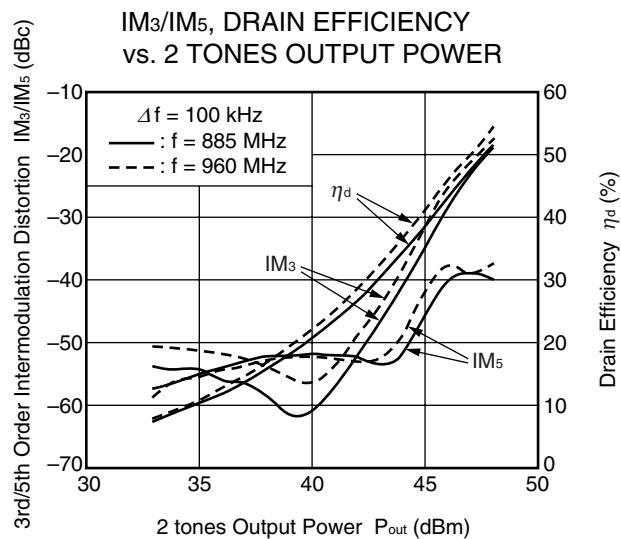
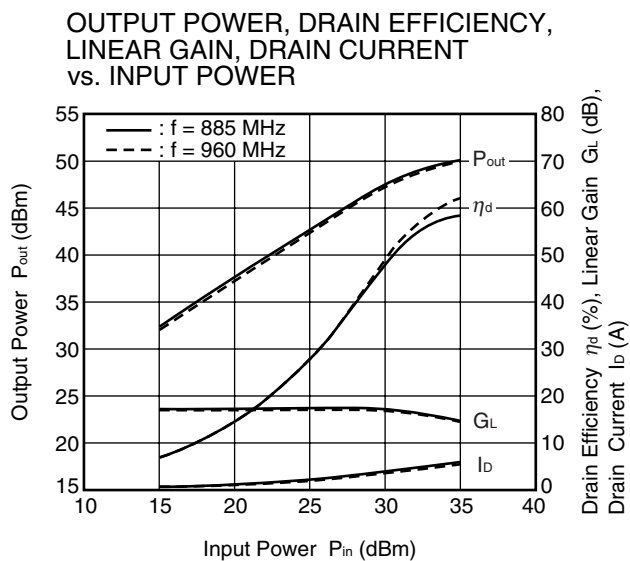
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = +25°C)**

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Gate to Source Leak Current	I <sub>GSS</sub>	V <sub>GSS</sub> = 5 V	−	−	1	μA
Saturated Drain Current	I <sub>DSS</sub>	V <sub>DSS</sub> = 65 V	−	−	1	mA
Gate Threshold Voltage	V <sub>th</sub>	V <sub>DS</sub> = 10 V, I <sub>D</sub> = 1 mA	1.7	2.2	2.8	V
Transconductance	g <sub>m</sub>	V <sub>DS</sub> = 28 V, I <sub>Dset</sub> = 550 mA	−	2.7	−	S
Drain to Source Breakdown Voltage	BV <sub>DSS</sub>	I <sub>DSS</sub> = 10 μA	65	75	−	V
Thermal Resistance	R <sub>th</sub> (ch-c)	Channel to Case	−	1.0	1.2	°C/W
Gain 1 dB Compression Output Power	P <sub>O</sub> (1 dB)	f = 960 MHz, V <sub>DS</sub> = 28 V, I <sub>Dset</sub> = 550 mA	−	48.8	−	dBm
Linear Gain	G <sub>L</sub> <sup>Note 1</sup>		16	17.5	−	dB
Output Power	P <sub>out</sub> <sup>Note 2</sup>		47.5	48.3	−	dBm
Drain Efficiency	η <sub>d</sub>		48	54	−	%
Power Added Efficiency	η <sub>add</sub>		−	53	−	%
3rd Order Intermodulation Distortion	IM <sub>3</sub>	f = 960/960.1 MHz, V <sub>DS</sub> = 28 V, I <sub>Dset</sub> = 550 mA, 2 tones P <sub>out</sub> = 45 dBm	−	−31	−	dBc

**Notes 1.** P<sub>in</sub> = 21 dBm

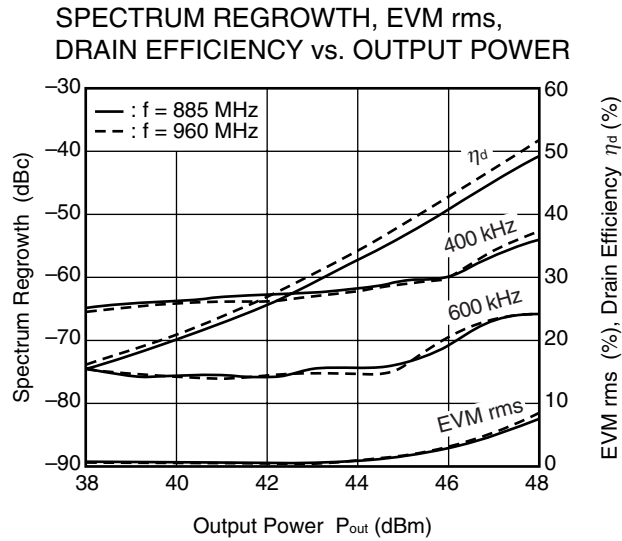
**2.** P<sub>in</sub> = 32 dBm

**TYPICAL CHARACTERISTICS ( $T_A = +25^\circ\text{C}$ ,  $V_{DS} = 28\text{ V}$ ,  $I_{Dset} = 550\text{ mA}$ , unless otherwise specified)**



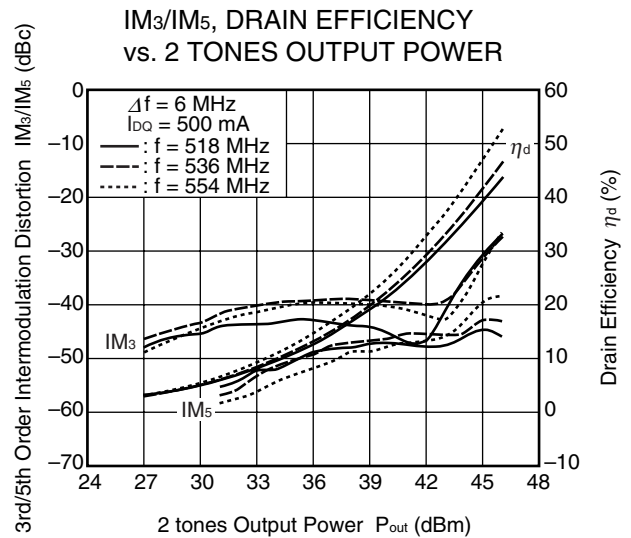
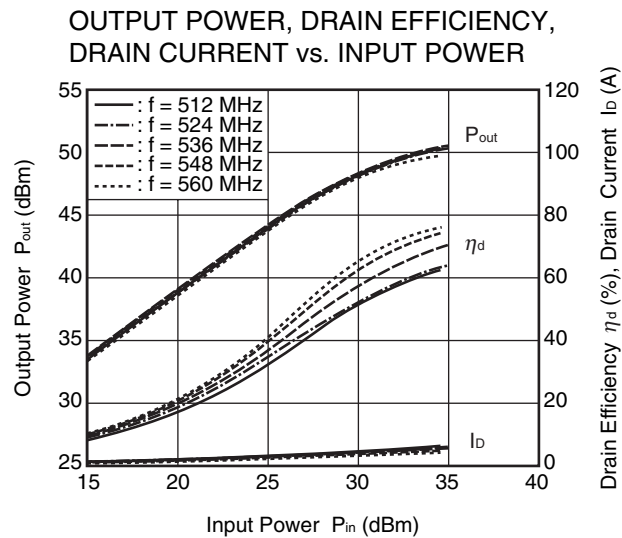
**Remark** The graphs indicate nominal characteristics.

**TYPICAL CHARACTERISTICS ( $T_A = +25^\circ\text{C}$ ,  $V_{DS} = 28\text{ V}$ ,  $I_{Dset} = 550\text{ mA}$ , EDGE Modulation Spectrum Performance, unless otherwise specified)**



**Remark** The graph indicates nominal characteristics.

**<R> TYPICAL CHARACTERISTICS ( $T_A = +25^\circ\text{C}$ , unless otherwise specified)**



**Remark** The graphs indicate nominal characteristics.

<R> **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.

Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

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

**3M (T-91M) (UNIT: mm)**



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- A circuit diagram of an n-channel MOSFET. The gate is connected to an input terminal labeled "Gate". The drain is connected to an output terminal labeled "Drain". The source is connected to ground, represented by a symbol with three parallel diagonal lines. The MOSFET symbol consists of a circle with a horizontal line on the left (gate), a vertical line on the right (drain), and a horizontal line at the bottom (source) with an arrow pointing outwards. The entire circuit is enclosed in a dashed rectangular box.

**Remark** ( ): Reference value

# RECOMMENDED MOUNTING CONDITIONS FOR CORRECT USE

- <R>
- (1) Fix to a heatsink 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).

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