

# PRELIMINARY DATA SHEET



## GaAs INTEGRATED CIRCUIT uPG2189TB

### L-BAND 4W HIGH POWER SPST SWITCH

#### DESCRIPTION

The uPG2189TB is a GaAs SPST switch MMIC which was developed for high power application of multi-band and multi-mode cellular handset. This device can operate frequency from 0.5GHz to 2.5GHz, having the low insertion loss and high linearity performance.

#### FEATURES

- Control Voltage :  $V_{cont(H)} = 1.8V$  TYP.
- Low Insertion Loss :  $L_{ins1} = 0.30dB$  TYP. @  $f = 1.0GHz$ ,  $V_{dd} = 2.6V$ ,  $V_{cont(H)} = 1.8V$   
:  $L_{ins2} = 0.35dB$  TYP. @  $f = 2.0GHz$ ,  $V_{dd} = 2.6V$ ,  $V_{cont(H)} = 1.8V$
- High Linearity :  $P_{in(0.1dB)} = > +37.0dBm$  TYP. @  $f = 1.0GHz$ ,  $V_{dd} = 2.6V$ ,  $V_{cont(H)} = 1.8V$   
:  $2fo = 68dBc$  TYP. @  $f = 1.0GHz$ ,  $P_{in} = +33dBm$ ,  $V_{dd} = 2.6V$ ,  $V_{cont(H)} = 1.8V$   
:  $3fo = 75dBc$  TYP. @  $f = 1.0GHz$ ,  $P_{in} = +33dBm$ ,  $V_{dd} = 2.6V$ ,  $V_{cont(H)} = 1.8V$
- Surface mounting : 6-pin super mini-mold package (2.0 × 2.1 × 0.9 mm)

#### APPLICATION

- High Power Application for Multi-band / multi-mode Cellular Handset

#### ORDERING INFORMATION

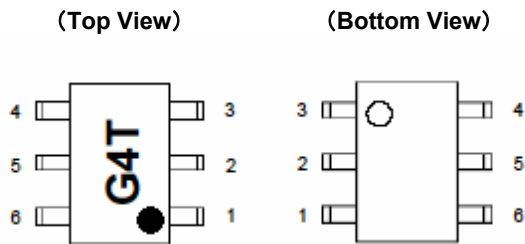
Part Number	Order Number	Package	Marking	Supplying Form
uPG2189TB – E4	uPG2189TB – E4 – A	6-pin super mini-mold (Pb-Free)	G4T	<ul style="list-style-type: none"><li>• Embossed tape 8 mm wide</li><li>• Pin4,5,6 face the perforation side of the tape</li><li>• Qty 3 kpcs/reel</li></ul>

**Remark** To order evaluation samples, contact your nearby sales office.  
Part number for sample order : uPG2189TB-A

#### Caution Electro-static sensitive devices

The information in this document is being issued in advance of the production cycle for device.  
The parameters for the device may change before final production or NEC Electronics Corporation, at its own discretion, may withdraw the device prior to its production.

**PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM**



Pin NO.	Pin Name
1	NC <small>note</small>
2	GND
3	OUTPUT
4	Vdd
5	INPUT
6	Vcont

Note : NC = No Connection, Internally not connected.

**Truth Table**

Vcont	INPUT-OUTPUT
High	ON
Low	OFF

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

Parameter	Symbol	Ratings	Unit
Switch Control Voltage	V <sub>cont</sub>	+6.0	V
Supply Voltage	V <sub>dd</sub>	+6.0	V
Input Power	P <sub>in</sub>	+38	dBm
Operating Ambient Temperature	T <sub>A</sub>	-45 ~ +85	°C
Storage Temperature	T <sub>stg</sub>	-55 ~ +150	°C

**RECOMMENDED OPERATING RANGE ( Unless otherwise specified, T<sub>A</sub> = +25°C)**

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Switch Control Voltage (H)	V <sub>cont</sub> (H)	+1.26	+1.8	V <sub>dd</sub>	V
Switch Control Voltage (L)	V <sub>cont</sub> (L)	0	0	+0.54	V
Supply Voltage	V <sub>dd</sub>	+2.4	+2.6	+4.2	V

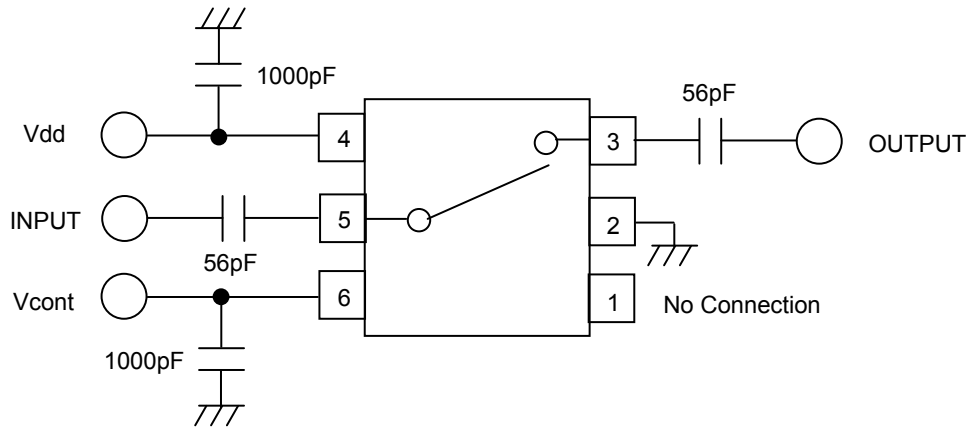
**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = +25°C, V<sub>dd</sub> = 2.6V, V<sub>cont</sub> (H) = 1.8V, V<sub>cont</sub> (L) = 0V, Z<sub>o</sub> = 50Ω, DC blocking capacitors = 56pF for each port, Unless otherwise specified )**

Parameter	Symbol	Conditions	MIN.	TYP.	MAX.	Unit
Insertion Loss1	L <sub>ins1</sub>	f = 0.5 to 1.0GHz	-	0.30	0.50	dB
Insertion Loss2	L <sub>ins2</sub>	f = 1.0 to 2.0GHz	-	0.35	0.55	dB
Insertion Loss3	L <sub>ins3</sub>	f = 2.0 to 2.5GHz	-	0.40	0.65	dB
Isolation1	ISL1	f = 0.5 to 1.0GHz, Pin=0dBm	17.0	19.5	-	dB
Isolation2	ISL2	f = 1.0 to 2.0GHz , Pin=0dBm	11.0	13.5	-	dB
Isolation3	ISL3	f = 2.0 to 2.5GHz , Pin=0dBm	9.0	11.5	-	dB
Isolation4	ISL4	f = 2.5 to 3.0GHz , Pin=0dBm	7.5	10.0	-	dB
Input Return Loss	RL <sub>in</sub>	f = 0.5 to 2.5GHz	15.0	19.0	-	dB
Output Return Loss	RL <sub>out</sub>	f = 0.5 to 2.5GHz	15.0	19.0	-	dB
0.1dB Loss Compression Input Power <sup>Note</sup>	P <sub>in(0.1dB)</sub>	f = 1.0GHz	+35	+37	-	dBm
2nd Harmonics (ON state)	2fo	f = 1.0GHz, Pin = +33dBm	65	68	-	dBc
3rd Harmonics (ON state)	3fo	f = 1.0GHz, Pin = +33dBm	65	75	-	dBc
2nd Harmonics (OFF state)	2fo	f = 1.0GHz, Pin = +33dBm	65	68	-	dBc
3rd Harmonics (OFF state)	3fo	f = 1.0GHz, Pin = +33dBm	65	75	-	dBc
Switching Speed	tsw	50% CTL to 90/10% RF	-	1.5	4.0	usec
Switch Control Current	I <sub>cont</sub>	V <sub>dd</sub> =2.6V, V <sub>cont</sub> = 1.8 / 0V, No RF input	-	0.1	5.0	uA
Supply Current 1	I <sub>dd1</sub>	V <sub>dd</sub> = 2.6V, V <sub>cont</sub> = 1.8V, No RF input	-	45	65	uA
		V <sub>dd</sub> = 2.6V, V <sub>cont</sub> = 0V, No RF input	-	25	45	uA
Supply Current 2	I <sub>dd2</sub>	V <sub>dd</sub> = 4.2V, V <sub>cont</sub> = 1.8V, No RF input	-	60	80	uA
		V <sub>dd</sub> = 4.2V, V <sub>cont</sub> = 0V, No RF input	-	35	55	uA
Supply Current 3	I <sub>dd3</sub>	V <sub>dd</sub> = 2.6V, V <sub>cont</sub> = 1.8V, Pin=33dBm	-	50	70	uA
		V <sub>dd</sub> = 2.6V, V <sub>cont</sub> = 0V, Pin=33dBm	-	35	55	uA
Supply Current 4	I <sub>dd4</sub>	V <sub>dd</sub> = 4.2V, V <sub>cont</sub> = 1.8V, Pin = +33dBm	-	70	90	uA
		V <sub>dd</sub> = 4.2V, V <sub>cont</sub> = 0V, Pin = +33dBm	-	45	65	uA

**Note.** P<sub>in(0.1dB)</sub> is measured the input power level when the insertion loss increases more 0.1dB than that of linear range.

**Caution :** This device is used it is necessary to use DC blocking capacitors.

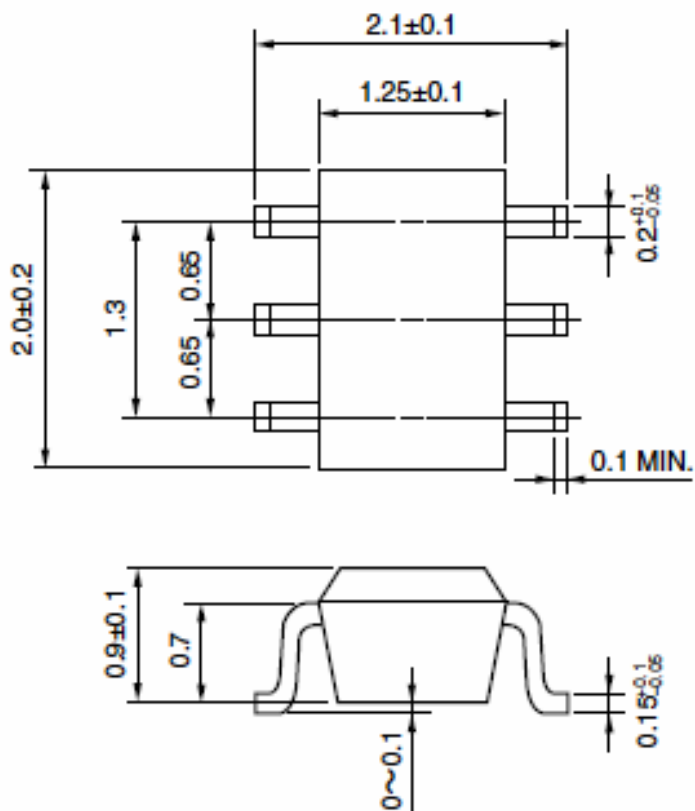
EVALUATION CIRCUIT



The application circuits and their parameters are for reference only and are not intended for use in actual design-ins.

PACKAGE DIMENSIONS

6-PIN PLASTIC SUPER MINI-MOLD (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
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).**

- **The information in this document is current as of April, 2006. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC Electronics data sheets or data books, etc., for the most up-to-date specifications of NEC Electronics products. Not all products and/or types are available in every country. Please check with an NEC Electronics sales representative for availability and additional information.**
- No part of this document may be copied or reproduced in any form or by any means without the prior written consent of NEC Electronics. NEC Electronics assumes no responsibility for any errors that may appear in this document.
- NEC Electronics does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC Electronics products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC Electronics or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of a customer's equipment shall be done under the full responsibility of the customer. NEC Electronics assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC Electronics endeavors to enhance the quality, reliability and safety of NEC Electronics products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC Electronics products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment and anti-failure features.
- NEC Electronics products are classified into the following three quality grades: "Standard", "Special" and "Specific".

The "Specific" quality grade applies only to NEC Electronics products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of an NEC Electronics product depend on its quality grade, as indicated below. Customers must check the quality grade of each NEC Electronics product before using it in a particular application.

"Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots.

"Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support).

"Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.

The quality grade of NEC Electronics products is "Standard" unless otherwise expressly specified in NEC Electronics data sheets or data books, etc. If customers wish to use NEC Electronics products in applications not intended by NEC Electronics, they must contact an NEC Electronics sales representative in advance to determine NEC Electronics' willingness to support a given application.

(Note)

- (1) "NEC Electronics" as used in this statement means NEC Electronics Corporation and also includes its majority-owned subsidiaries.
- (2) "NEC Electronics products" means any product developed or manufactured by or for NEC Electronics (as defined above).

M8E 02.11-1

**SAFETY INFORMATION ON THIS PRODUCT**

<b>Caution</b>	GaAs products	<p>The product contains gallium arsenide, GaAs. GaAs vapor and powder are hazardous to human health if inhaled or ingested.</p> <ul style="list-style-type: none"><li>· Do not destroy or burn the product.</li><li>· Do not cut or cleave off any part of the product.</li><li>· Do not crush or chemically dissolve the product.</li><li>· Do not put the product in the mouth.</li></ul> <p>Follow related laws and ordinances for disposal. The product should be from general industrial waste or household garbage.</p>
----------------	---------------	---

