CEL

NEC's 1 W ULTRA SMALL SPDT SWITCH

UPG2030TK

FEATURES

- **SWITCH CONTROL VOLTAGE:**
  $V_{cont\ (H)}$ = 2.7 to 3.0 V (2.8 V TYP.)
  $V_{cont\ (L)}$ = –0.2 to +0.2 V (0 V TYP.)
- **LOW INSERTION LOSS:**
  0.25 dB TYP. @ 0.5 to 1.0 GHz
  0.30 dB TYP. @ 1.0 to 2.0 GHz
  0.35 dB TYP. @ 2.0 to 2.5 GHz
- **HIGH ISOLATION:**
  27 dB TYP. @ 0.5 to 2.0 GHz
  24 dB TYP. @ 2.0 to 2.5 GHz
- **POWER HANDLING:**
  $P_{in\ (0.1\ dB)}$ = +27.0 dBm TYP. @ 2.0 GHz, V_{cont} = 2.8 V/0 V
  $P_{in\ (1\ dB)}$ = +30.0 dBm TYP. @ 2.0 GHz, V_{cont} = 2.8 V/0 V
  (Reference value)
- **HIGH-DENSITY SURFACE MOUNTING:**
  6-pin minimold package (1.5 × 1.1 × 0.55 mm)
- **PB-FREE**

DESCRIPTION

NEC's UPG2030TK is a GaAs MMIC L, S-band SPDT (Single Pole Double Throw) switch for mobile phone and L, S-band applications.

This device has low insertion loss and high isolation, and can operate from 0.5 to 3 GHz at 2.7 to 3.0 V.

This device is housed in a 6-pin low profile, Pb-Free minimold package and this package is also suitable for high-density surface mounting.

APPLICATIONS

- **CELLULAR AND CORDLESS HANDSETS**
- **PCS, BLUETOOTH™, WLAN, AND WLL**
- **SHORT RANGE WIRELESS**

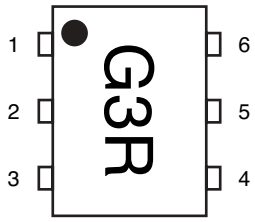
ORDERING INFORMATION

PART NUMBER	PACKAGE	MARKING	SUPPLYING FORM
UPG2030TK-E2-A	6-pin lead-less minimold (1511)	G3R	• Embossed tape 8 mm wide • Pin 1, 6 face the perforation side of the tape • Qty 5 kpcs/reel

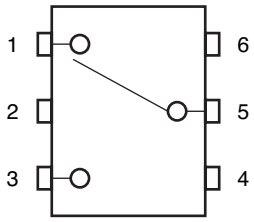
Remark To order evaluation samples, contact your nearby sales office.
Part number for sample order: UPG2030TK-A

PIN CONNECTIONS AND INTERNAL BLOCK DIAGRAM

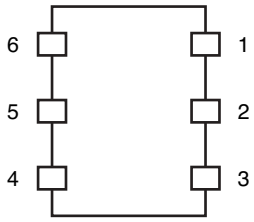
(Top View)



(Top View)



(Bottom View)



PIN NO.	PIN NAME
1	OUTPUT1
2	GND
3	OUTPUT2
4	V_{cont2}
5	INPUT
6	V_{cont1}

TRUTH TABLE

V_{CONT1}	V_{CONT2}	INPUT–OUTPUT1	INPUT–OUTPUT2
Low	High	ON	OFF
High	Low	OFF	ON

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

PARAMETER	SYMBOL	RATINGS	UNIT
Switch Control Voltage	V_{cont}	6.0	V
Input Power	P_{in}	+33	dBm
Operating Ambient Temperature	T_A	–45 to +85	°C
Storage Temperature	T_{stg}	–55 to +150	°C

RECOMMENDED OPERATING RANGE (T_A =+25ºC, unless otherwise specified)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Switch Control Voltage (H)	$V_{cont\ (H)}$	2.7	2.8	3.0	V
Switch Control Voltage (L)	$V_{cont\ (L)}$	–0.2	0	0.2	V

ELECTRICAL CHARACTERISTICS

(T_A = +25°C, V_{cont} = 2.8V/0 V , DC blocking capacotors = 56 pF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Insertion Loss 1	L_{INS1}	f = 0.5 to 1.0 GHz	−	0.25	0.45	dB
Insertion Loss 2	L_{INS2}	f = 1.0 to 2.0 GHz	−	0.30	0.50	dB
Insertion Loss 3	L_{INS3}	f = 2.0 to 2.5 GHz	−	0.35	0.55	dB
Isolation 1	ISL_1	f = 0.5 to 2.0 GHz	23	27	−	dB
Isolation 2	ISL_2	f = 2.0 to 2.5 GHz	20	24	−	dB
Input Return Loss	RL_{in}	f = 0.5 to 2.5 GHz	15	20	−	dB
Output Return Loss	RL_{out}	f = 0.5 to 2.5 GHz	15	20	−	dB
0.1 dB Gain Compression Input Power Note	$P_{in\ (0.1\ dB)}$	f = 2.0 GHz	+25.5	+27.0	−	dBm
		f = 2.5 GHz	+25.5	+27.0	−	dBm
Switch Control Current	I_{cont}	No signal	−	4	20	μA
Switch Control Speed	t_{SW}		−	50	500	ns

Notes $P_{in\ (0.1\ dB)}$ is the measured input power level when the insertion loss increases 0.1 dB more than that of linear range.

STANDARD CHARACTERISTICS FOR REFERENCE

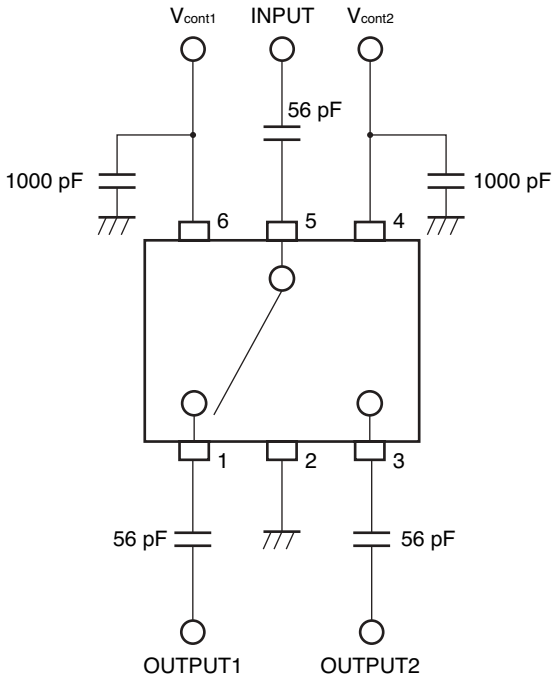
(T_A = +25°C, V_{cont} = 2.8 V/0 V, DC blocking capacitors = 56 pF, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
1 dB Gain Compression Input Power Note	$P_{in\ (1\ dB)}$	f = 2.0 GHz	−	+30.0	−	dBm

Notes $P_{in\ (1\ dB)}$ is the measured input power level when the insertion loss increases 1 dB more than that of linear range.

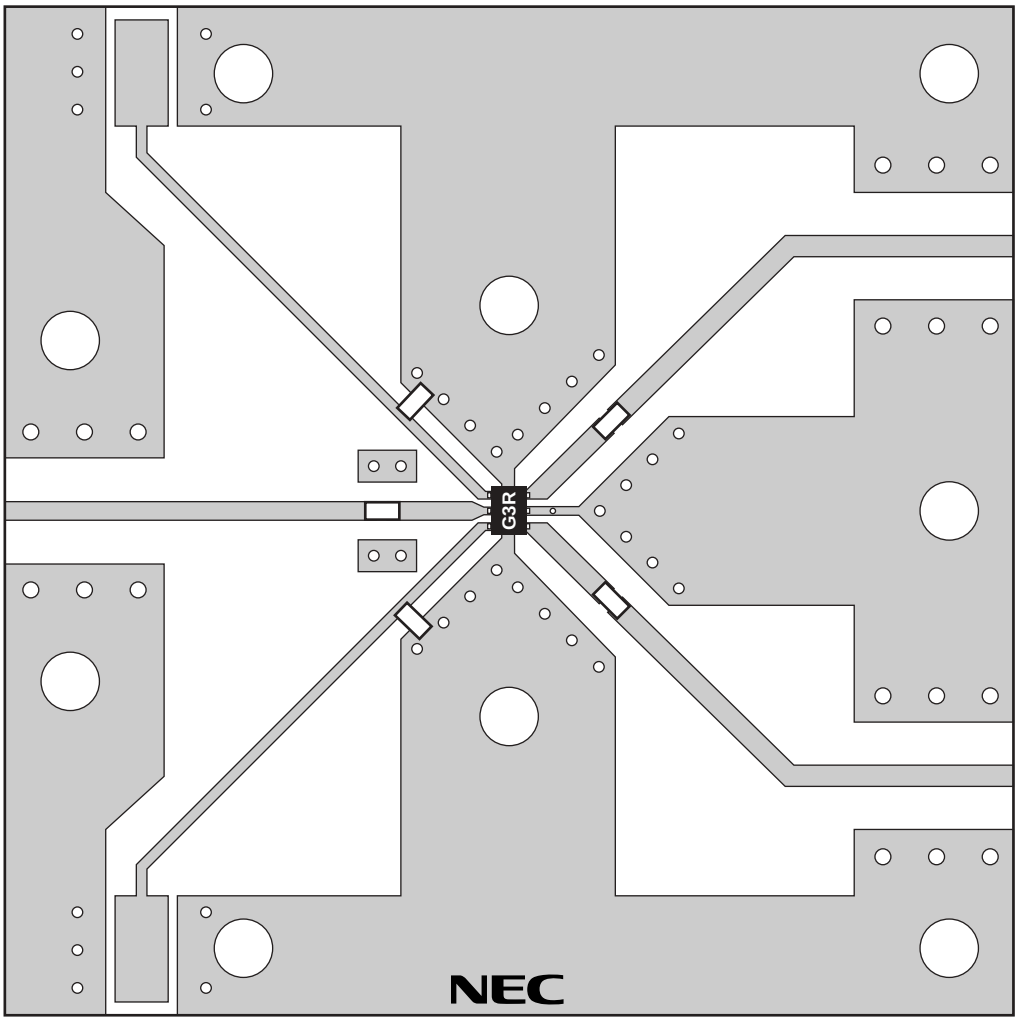
Caution It is necessary to use DC blocking capacitors with this device.
The value of DC blocking capacitors should be chosen to accommodate the frequency of operation, bandwidth, switching speed and the condition with the actual board of your system. The range of recommended DC blocking capacitor value is less than 100 pF for frequencies above 0.5 GHz, and 1,000 pF for frequencies below 0.5 GHz.

EVALUATION CIRCUIT (V_{cont} = 2.8 V/0 V, DC blocking capacitors = 56 pF)



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

ILLUSTRATION OF THE TEST CIRCUIT ASSEMBLED ON EVALUATION BOARD

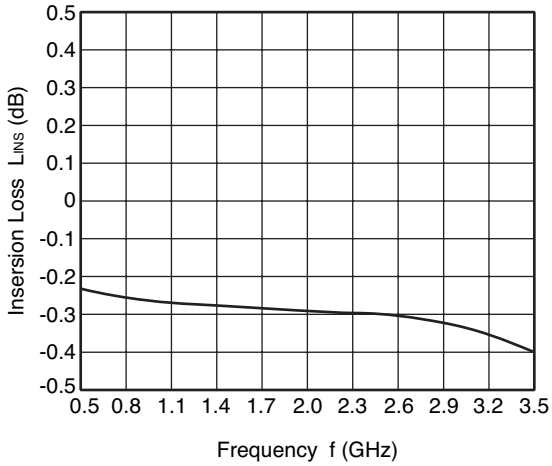


USING THE NEC EVALUATION BOARD

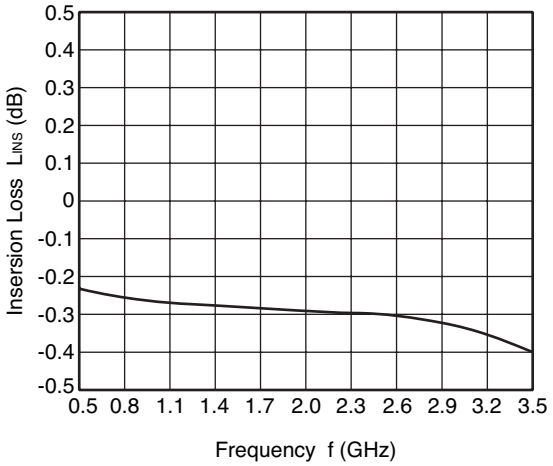
SYMBOL	VALUES
C1, C2, C3	56 pF
C4, C5	1000 pF

TYPICAL CHARACTERISTICS (T_A = +25°C, V_{cont} = 2.8 V/0 V, DC blocking capacitors = 56 pF, unless otherwise specified)

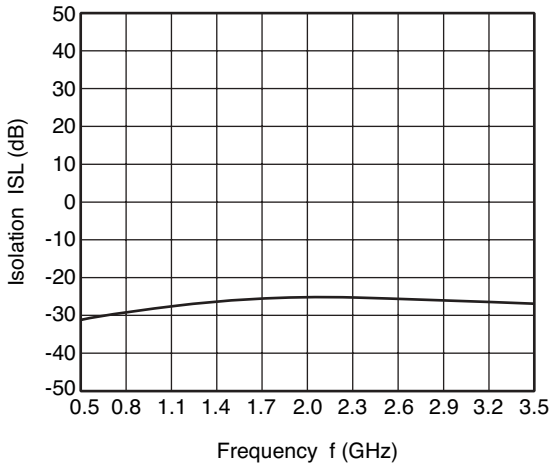
INPUT-OUTPUT1
INSERSION LOSS vs. FREQUENCY



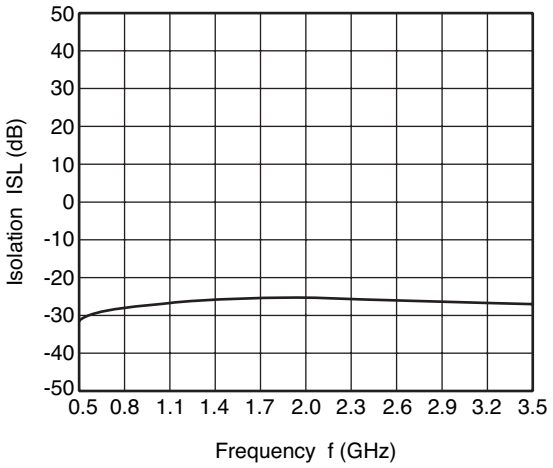
INPUT-OUTPUT2
INSERSION LOSS vs. FREQUENCY



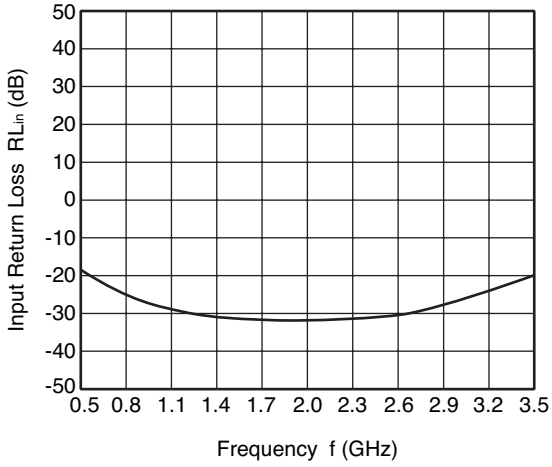
INPUT-OUTPUT1
ISOLATION vs. FREQUENCY



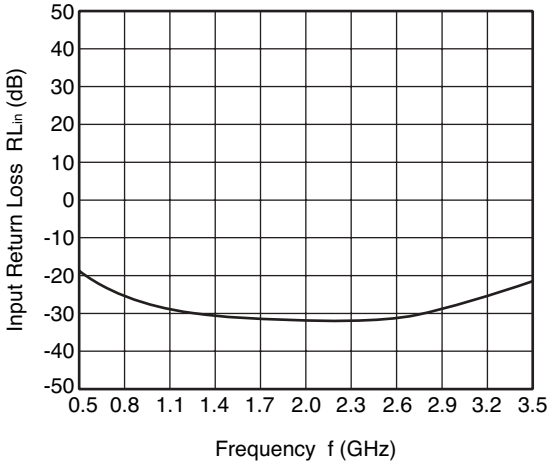
INPUT-OUTPUT2
ISOLATION vs. FREQUENCY



INPUT-OUTPUT1
INPUT RETURN LOSS vs. FREQUENCY



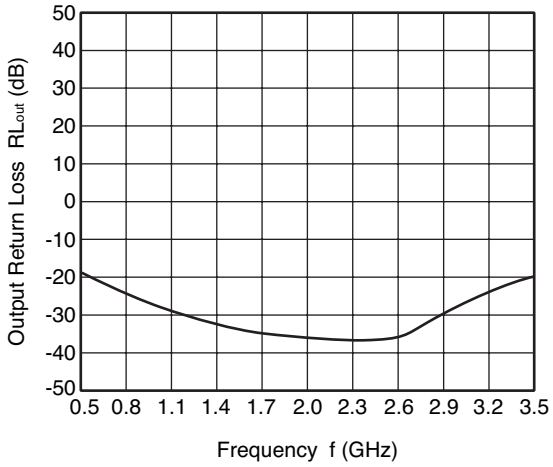
INPUT-OUTPUT2
INPUT RETURN LOSS vs. FREQUENCY



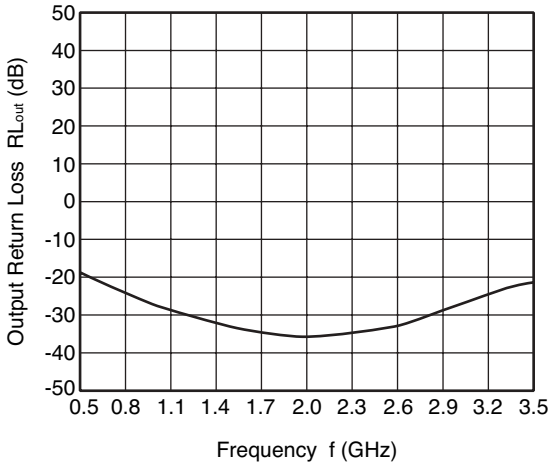
Remark The graphs indicate nominal characteristics.

TYPICAL CHARACTERISTICS (T_A = +25°C, V_{cont} = 2.8 V/0 V, DC blocking capacitors = 56 pF, unless otherwise specified)

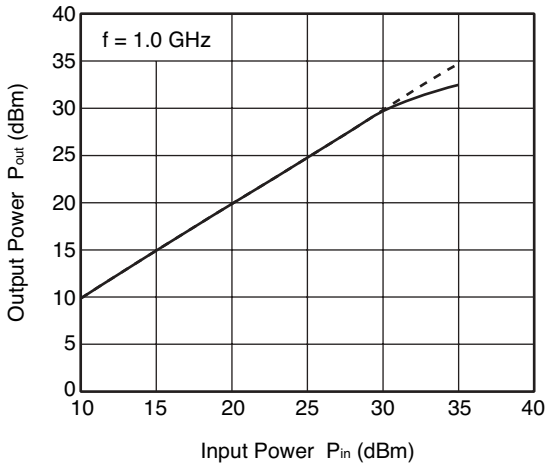
INPUT-OUTPUT1
OUTPUT RETURN LOSS vs. FREQUENCY



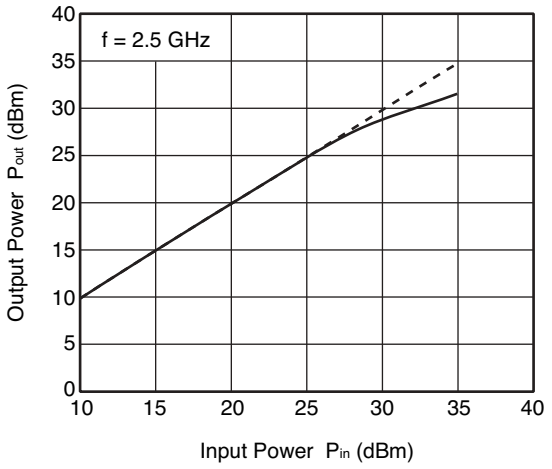
INPUT-OUTPUT2
OUTPUT RETURN LOSS vs. FREQUENCY



OUTPUT POWER vs. INPUT POWER



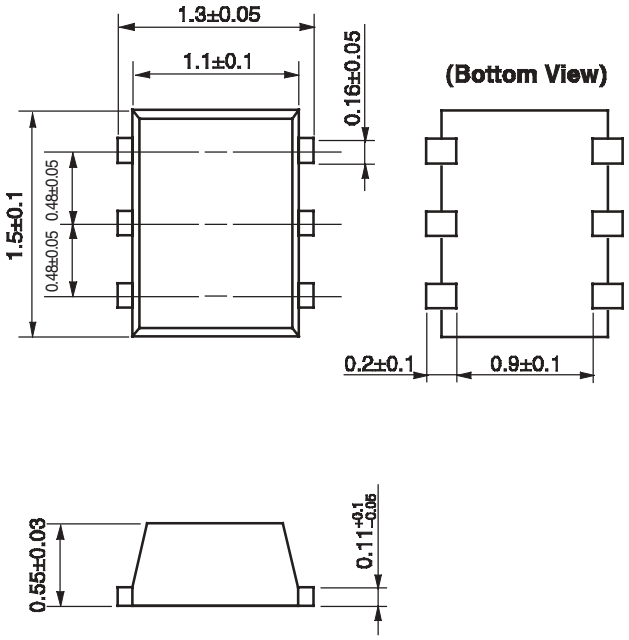
OUTPUT POWER vs. INPUT POWER



Remark The graphs indicate nominal characteristics.

PACKAGE DIMENSIONS

6-PIN LEAD-LESS MINIMOLD (1511) (UNIT:mm)



Remark ( ) : Reference value

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	IR260
	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	
VPS	Peak temperature (package surface temperature)	: 215°C or below	VP215
	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	
Wave Soldering	Peak temperature (molten solder temperature)	: 260°C or below	WS260
	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	
Partial Heating	Peak temperature (pin temperature)	: 350°C or below	HS350
	Soldering time (per side of device)	: 3 seconds or less	
	Maximum chlorine content of rosin flux (% mass)	: 0.2%(Wt.) or below	

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