

**NEC****L, S Band SPDT GaAs MMIC Switch****UPG153TB  
UPG155TB****FEATURES**

- **LOW INSERTION LOSS:**  
LINS = 0.5 dB TYP (UPG153TB), 0.6 dB TYP (UPG155TB)  
at VCONT = +3.0 V/0 V, f = 1 GHz
- **HIGH LINEARITY SWITCHING:**  
Pin (0.1 dB) = +29.0 dBm TYP (UPG153TB)  
Pin (0.1 dB) = +30.5 dBm TYP (UPG155TB)  
at VCONT = +3.0 V/0 V, f = 2 GHz
- **SMALL 6 PIN MINI-MOLD PACKAGE:**  
Size: 2.0 x 1.25 x 0.9 mm

**DESCRIPTION**

The UPG153TB and UPG155TB are L-band SPDT (Single Pole Double Throw) GaAs FET switches for digital cellular or cordless telephone application. The devices can operate from 100 MHz to 2.5 GHz with low insertion loss. These devices are housed in an original 6 pin super mini-mold package similar to SOT363.

NEC's stringent quality assurance and test procedures assure the highest reliability and performance.

**APPLICATION**

- **L, S-BAND DIGITAL CELLULAR OR CORDLESS TELEPHONE**
- **PCS, WLAN AND WLL APPLICATIONS**

**ELECTRICAL CHARACTERISTICS**

(Unless otherwise specified, TA = 25°C, VCONT1 = 3 V, VCONT2 = 0 V or VCONT1 = 0 V, VCONT2 = 3 V; off chip DC blocking capacitor value, 51 pF)

PART NUMBER PACKAGE OUTLINE			UPG153TB S06			UPG155TB S06		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX
LINS	Insertion Loss at f = 0.1 to 1 GHz f = 2 GHz f = 2.5 GHz	dB dB dB		0.5 0.7 0.9	0.65 0.9		0.6 0.75 0.9	0.8 1.0
ISOL	Isolation at f = 0.1 to 2 GHz f = 2.5 GHz f = 1 GHz	dB dB dB	10 15	13 10 18.5		13 18	16 10 21.5	
RLIN	Input Return Loss at f = 0.1 to 2 GHz	dB	11	15		11	15	
RLOUT	Input Return Loss at f = 0.1 to 2 GHz	dB	11	15		11	15	
PIN(0.1 dB)	Input Power at 0.1 dB Compression Point, f = 2 GHz	dBm		29			30.5	
PIN(1 dB)	Input Power at 1 dB Compression Point, f = 2 GHz	dBm	31	33		32	34	
tsw	Switching Speed	ns		30			30	
ICONT	Control Current at VCONT = 3 V/0 V, no RF signal	μA		20	50		20	50

Note:

1. It is necessary to use DC blocking capacitors for the RF input and RF output. The value of DC blocking capacitors should be chosen to accommodate the frequency of operation. The range of recommended DC blocking capacitor value is less than 100 pF.
2. The distance between IC's GND pin and ground pattern of substrate should be as short as possible to avoid parasitics.

**ABSOLUTE MAXIMUM RATINGS<sup>1</sup>** (T<sub>A</sub> = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V <sub>CONT1,2</sub>	Control Voltage 1, 2 <sup>2</sup>	V	-6 to +6
P <sub>IN</sub>	Input Power UPG155TB UPG153TB	dBm	+34 +33
P <sub>TOT</sub>	Total Power Dissipation <sup>3</sup>	W	0.15
T <sub>A</sub>	Operating Temperature	°C	-45 to +85
T <sub>STG</sub>	Storage Temperature	°C	-55 to +150

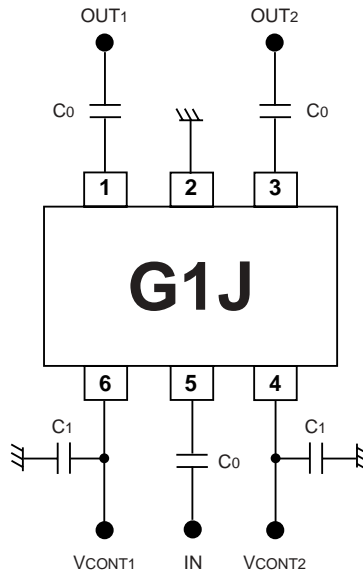
Notes:

1. Operation in excess of any one of these conditions may result in permanent damage.
2.  $2.5\text{ V} \leq |V_{\text{CONT1}} - V_{\text{CONT2}}| \leq 6\text{ V}$
3. Mounted on a 50 x 50 x 1.6 mm double copper clad epoxy glass PWB, T<sub>A</sub> = +85 °C.

**RECOMMENDED OPERATING CONDITIONS** (T<sub>A</sub> = 25°C)

SYMBOLS	PARAMETERS	UNITS	UPG153TB			UPG155TB		
			MIN	TYP	MAX	MIN	TYP	MAX
V <sub>CONT</sub>	Control Voltage (High)	V	+2.5	+3	+5.3	+2.7	+3	+5.3
V <sub>CONT</sub>	Control Voltage (Low)	V	-0.2	0	+0.2	-0.2	0	+0.2

**TEST CIRCUIT<sup>1</sup>**



Note:

1. (T<sub>A</sub> = 25°C, V<sub>CONT1</sub> = +3 V, V<sub>CONT2</sub> = 0 V, V<sub>CONT1</sub> = 0 V, V<sub>CONT2</sub> = +3 V, f = 2 GHz; off chip DC blocking capacitors value: C<sub>0</sub> = 51 pF, C<sub>1</sub> = 1000 pF (Bypass))

**TRUTH TABLE OF SWITCHING BY CONDITION OF CONTROL VOLTAGE**

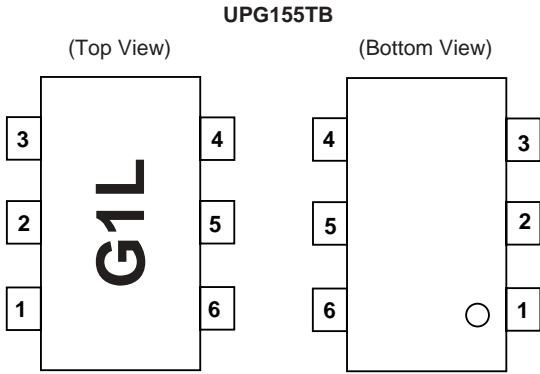
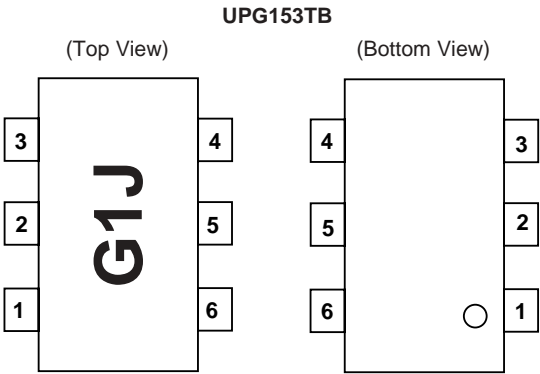
		V <sub>CONT1</sub>	
		V <sub>CONT(H)</sub>	V <sub>CONT(L)</sub>
V <sub>CONT2</sub>	V <sub>CONT(H)</sub>		
	V <sub>CONT(L)</sub>		

Note:

1. In case of V<sub>CONT1</sub> = V<sub>CONT2</sub> = High or V<sub>CONT1</sub> = V<sub>CONT2</sub> = Low (that is same control voltage for both pins), input signal (Pin 5) is output to OUT1 (Pin 1) and OUT2 (Pin 3).

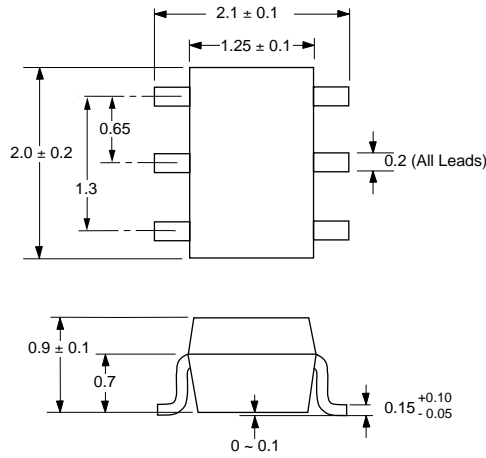
**PIN CONNECTION DIAGRAM**

PIN NO.	CONNECTION
1	OUT1
2	GND
3	OUT2
4	V <sub>CONT2</sub>
5	IN
6	V <sub>CONT1</sub>



**OUTLINE DIMENSIONS** (Units in mm)

PACKAGE OUTLINE S06



Note:  
All dimensions are typical unless otherwise specified.

**ORDERING INFORMATION**

PART NUMBER	QUANTITY
UPG153TB-E3	3 kpcs/Reel
UPG155TB-E3	3 kpcs/Reel

Note:  
Embossed Tape, 8 mm wide,  
Pins 1, 2, 3 face tape perforation side.

Life Support Applications

These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.

EXCLUSIVE NORTH AMERICAN AGENT FOR **NEC** RF, MICROWAVE & OPTOELECTRONIC SEMICONDUCTORS

**CEL CALIFORNIA EASTERN LABORATORIES** • Headquarters • 4590 Patrick Henry Drive • Santa Clara, CA 95054-1817 • (408) 988-3500 • Telex 34-6393 • FAX (408) 988-0279  
DATA SUBJECT TO CHANGE WITHOUT NOTICE

Internet: <http://WWW.CEL.COM>

12/5/2001