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# SL490B

## REMOTE CONTROL TRANSMITTER

(Supersedes version in April 1994 Consumer IC Handbook, HB3120 - 2.0)

GPS has developed and produced a range of monolithic integrated circuits which give a wide variety of remote control facilities. As well as ultrasonic or infra-red transmission, cable, radio or telephone links may also be used. Pulse Position Modulation (PPM) is used with or without carrier and automatic error detection is incorporated. Initially designed with TV remote control in mind, the device is also suitable for use in radios, tuners, tape and record decks, lamps and lighting, toys and models, industrial control and monitoring.

The SL490B is an easily extendable, 32-command PPM transmitter drawing negligible standby current.

### FEATURES

- Ultrasonic or Infra-Red Transmission
- Direct Drive or Ultrasonic Transducer
- Direct Drive of Visible LED when using Infra-Red
- Very Low Power Requirements
- Pulse Position Modulation gives Excellent Immunity from Noise and Multipath Reflections
- Single Pole Key Matrix
- Switch Resistance up to 1kΩ Tolerated
- Low External Component Count
- On-Chip Anti-Bounce Circuitry

### ABSOLUTE MAXIMUM RATINGS

Supply voltage, $V_{CC}$	+9-5V
Total power dissipation	600mW
Operating temperature range	-10°C to +60°C
Storage temperature range	-55°C to +150°C

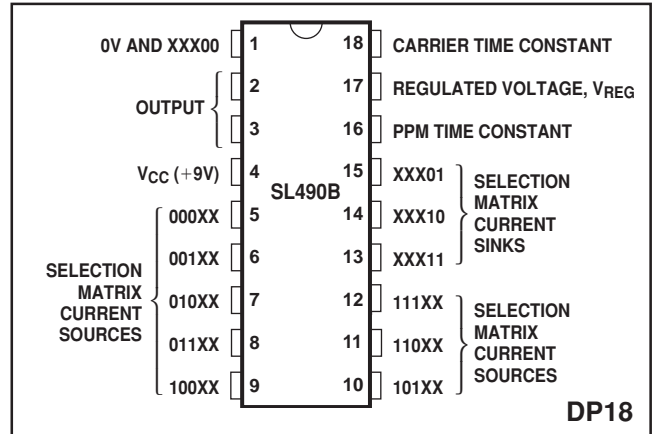


Fig. 1 Pin connections - top view

### QUICK REFERENCE DATA

- Power Supply: 9V Standby 6μA, Operating 8mA
- Modulation: Pulse Position with or without Carrier
- Coding: 5-Bit Word giving a Primary Command Set of 32 Commands
- Key Entry: 8 × 4 Single Pole Key Matrix
- Data Rate: Selectable 1Bit/Sec to 10kBit/Sec.
- Carrier Frequency: Selectable 0Hz (No Carrier) to 200kHz

### ORDERING INFORMATION

SL490B NA DP

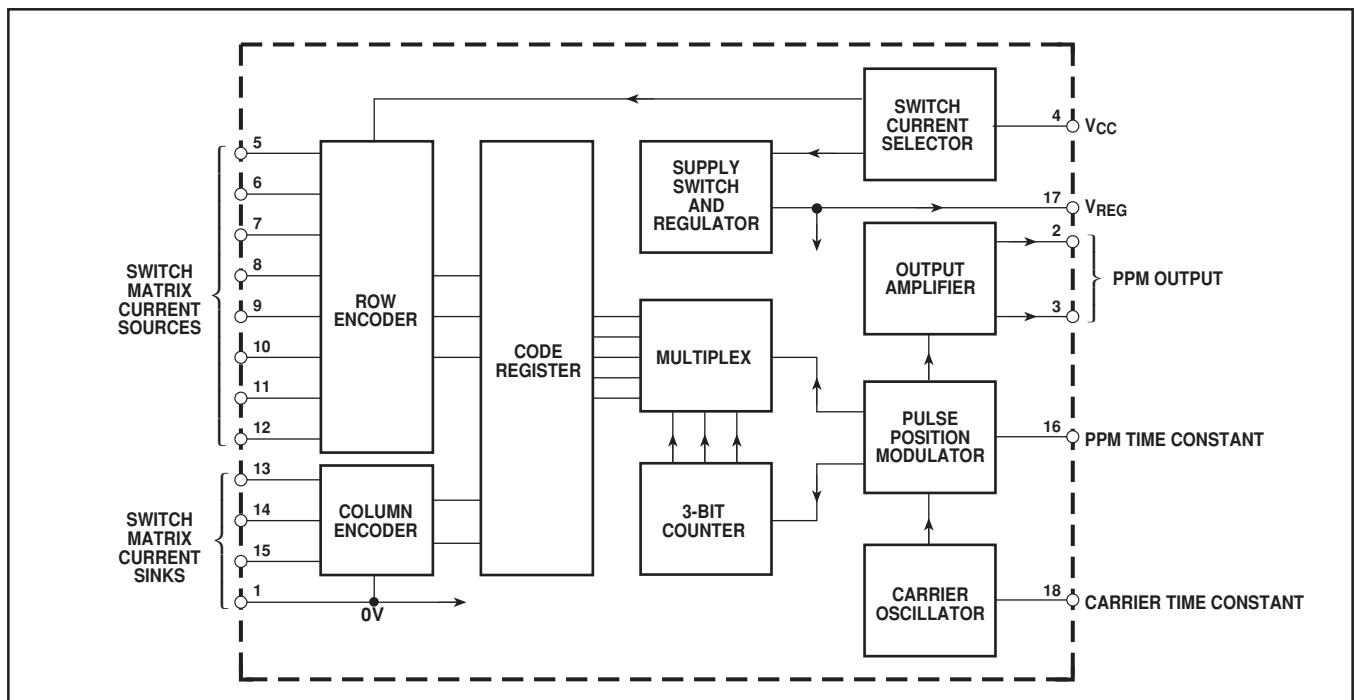


Fig. 2 SL486 block diagram

**ELECTRICAL CHARACTERISTICS**

These characteristics are guaranteed over the following conditions (unless otherwise stated):

$T_{AMB} = +25^{\circ}\text{C}$ ,  $V_{CC} = +7\text{V}$  to  $+10.5\text{V}$ . Test circuit: Fig. 4. Timings are defined in Fig. 3.

Characteristic	Pin	Value			Units	Conditions
		Min.	Typ.	Max.		
Operating supply current	4		9.5	16	mA	$V_{CC} = 9.5\text{V}$
Standby supply current	4			10	$\mu\text{A}$	
Regulated voltage, $V_{REG}$	17	4.1		4.9	V	
Regulator output current, $I_{REG}$	17			1	mA	
Output voltage swing	2,3	$V_{CC} - 1$			V	Unloaded
Output voltage	2			1	V	} peak value <1ms $I_2 = 10\text{mA}$ $I_3 = 5\text{mA}$
Output voltage	3			1	V	
Keypad switch resistance	5-15			5	k $\Omega$	
Carrier time constant resistor, R2	18	20	40	80	k $\Omega$	$C2 = 680\text{pF}$ , $f_c \approx 50\text{kHz}$ ; see Fig. 4
PPM time constant resistor, R1	16	15	30	60	k $\Omega$	
$t_1$ deviation from calculated value, using fixed timing components	2,3			$\pm 10$	%	} $t_1 = 0.95C1R1$ , see Fig. 4 $R1 = 15\text{k}\Omega$ $R1 = 60\text{k}\Omega$
				$\pm 10$	%	
<b>Variation of <math>t_1</math> and <math>t_0</math> with <math>V_{CC}</math></b>						} $\Delta V_{CC} = 3.5\text{V}$ (7V to 10.5V)
$\Delta t_1$	2,3			$\pm 4$	%	
$\Delta t_0$	2,3			$\pm 4$	%	
Ratio $t_0/t_1$	2,3	1.4		1.6		
Pulse width, $t_p$	2,3	$0.11t_1$		$0.22t_1$		
Interword gap, $t_g$	2,3		$3t_1$			Derived by counting

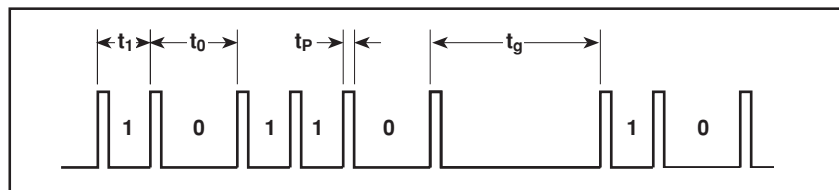


Fig. 3 PPM word notation and timing definitions

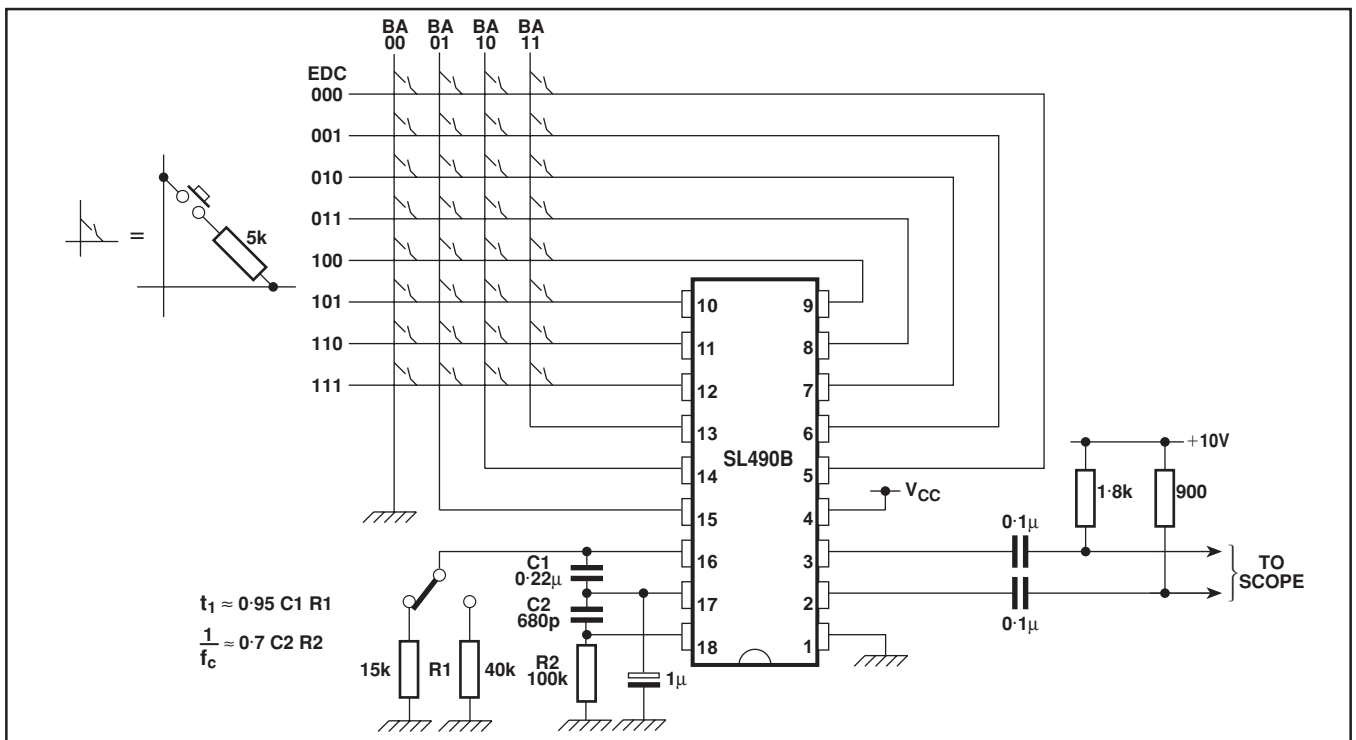


Fig. 4 Test circuit

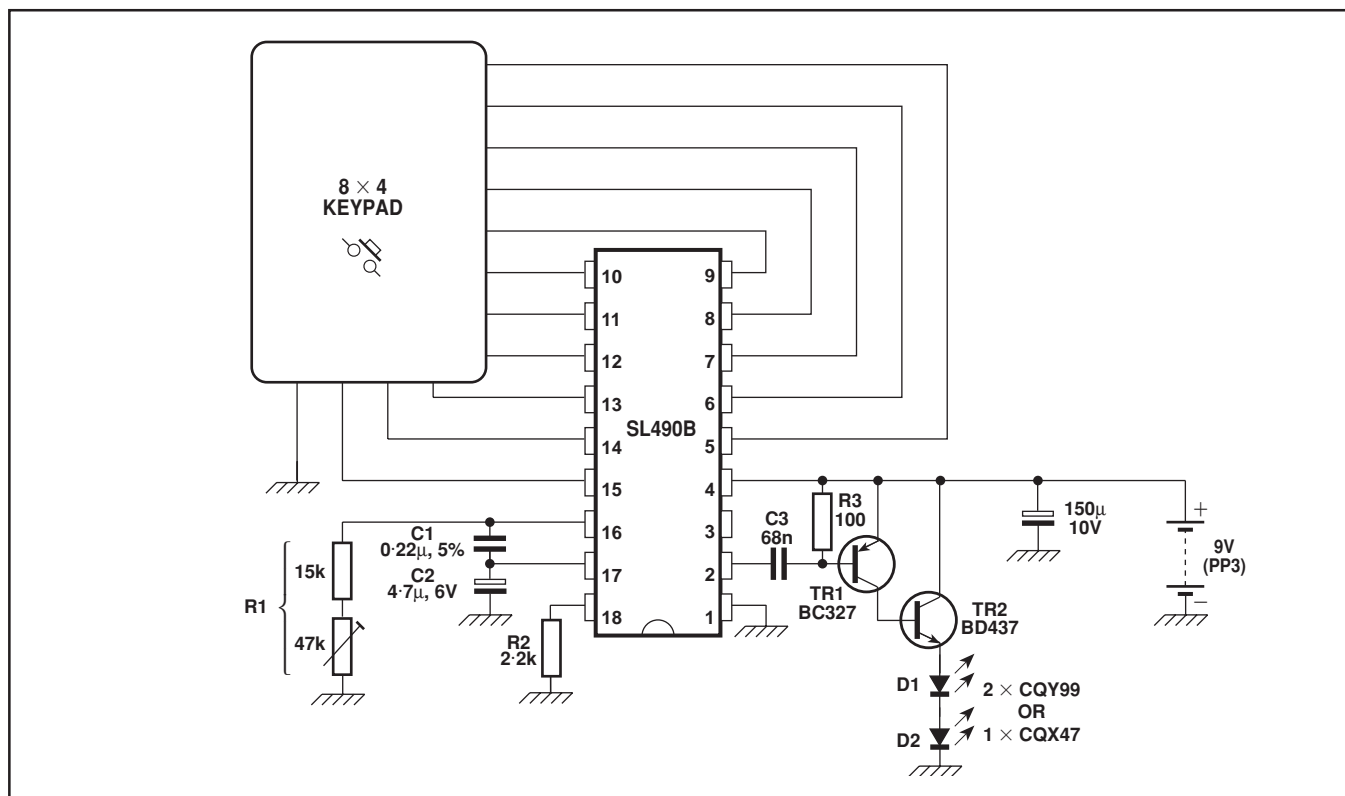


Fig. 5 Infra-red application circuit

## OPERATING NOTES

Fig. 5 shows the circuit for a simple infra-red transmitter where the PPM output pulses from pin 2 of the SL490B are differentiated by C3 and R3 and amplified by TR1 to produce current pulses about 15µs wide. These pulses are further amplified by TR2 and applied to the infra-red diodes D1 and D2.

The current in the diodes and the infra-red output is controlled by the quantity, type, and connection method of the diodes and also by the gain, at high currents, of the transistors.

The most common solution where cost is important is to use two single-chip diodes, such as the CQY99 connected in series.

Improved output can be obtained by using four CQY99 diodes in a series/parallel arrangement, but it is usually simpler to use two multi-chip diodes such as the CQX47 connected in parallel or a single CQX19, which gives similar results.

A significant increase in range can be obtained by using diodes such as the CQY99 in conjunction with a plated plastic parabolic reflector.

When building the transmitter, care should be taken with the choice of the capacitor C4 and with the circuit layout, particularly when multi-chip diodes are being used, as the current pulses can be as high as 6 to 8A.

Transistor choice is also important and any substitutes should have high current gain characteristics and switching speeds compatible with the application.

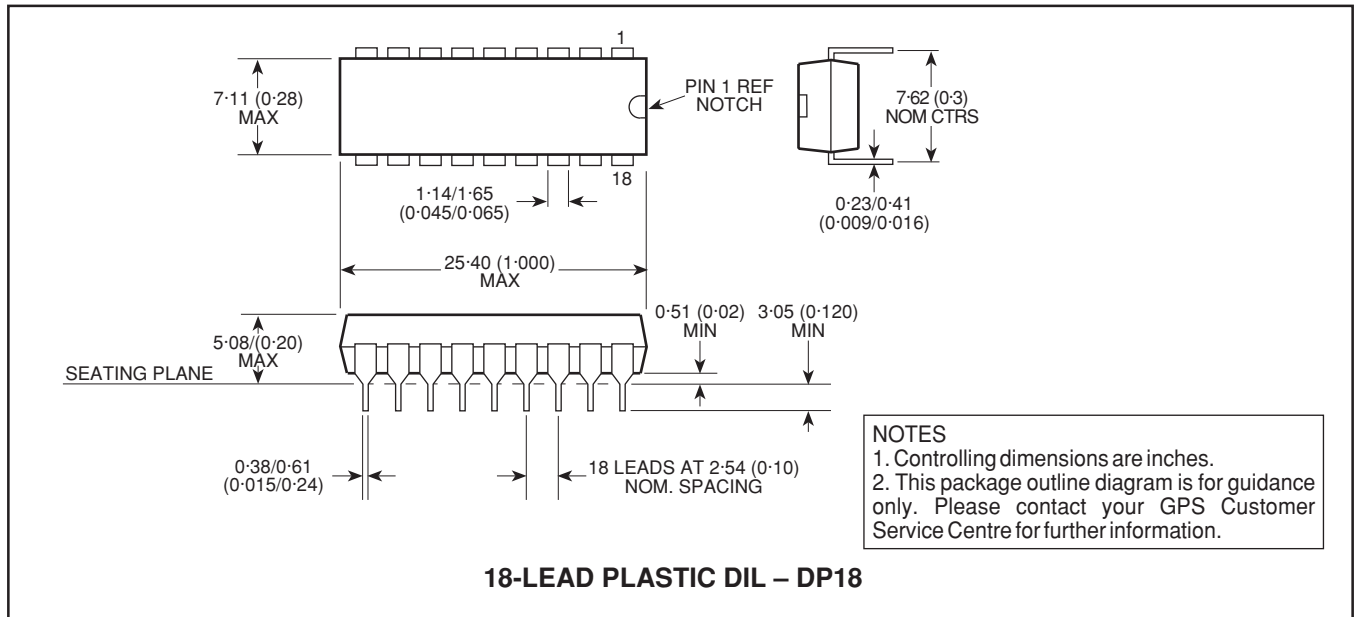
An increase in output can be obtained by connecting TR2 in common emitter configuration, but care should be taken not to exceed the rating of the diodes.

## Choice of PPM Frequency

When the transmitter is being used with an infra-red link, with high current pulses fed to the diodes as in Fig. 5, power consumption will increase with frequency. It is thus advisable that, with a battery power supply, the slowest PPM rate consistent with adequate response time should be chosen.

**PACKAGE DETAILS**

Dimensions are shown thus: mm (in)



**HEADQUARTERS OPERATIONS**  
**GEC PLESSEY SEMICONDUCTORS**  
 Cheney Manor, Swindon,  
 Wiltshire SN2 2QW, United Kingdom.  
 Tel: (0793) 518000  
 Fax: (0793) 518411

**GEC PLESSEY SEMICONDUCTORS**  
 P.O. Box 660017  
 1500 Green Hills Road,  
 Scotts Valley, CA95067-0017  
 United States of America.  
 Tel (408) 438 2900  
 Fax: (408) 438 5576

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