

# M51903L

6249826 MITSUBISHI ELEK (LINEAR)

80C 09161 D T-52-13-07

## LED LINEAR LEVEL INDICATOR

### DESCRIPTION

The M51903L is a semiconductor integrated circuit consisting of a circuit designed for use in level meters. It is capable of driving 5 LEDs to create a bar-type display. In accordance with the input level, the uppermost LED brightness varies to form a linear indicator, making this device ideal for use in signal meters and VU meters. A low-voltage reference power supply is built in, so that the only external components required are LEDs, resistors and capacitors.

### FEATURES

- Bar-type display of input level using 5 LEDs
- The uppermost LED brightness varies linearly with respect to the input level resulting in a high-resolution display with no radiation.
- By changing the external resistance values, the LED brightness can be adjusted .....  $I_o=15\text{mA}(\text{max.})$
- Operates over a wide range of supply voltages .....  $V_{CC}=4\sim 18\text{V}$
- Built-in reference supply
- High input impedance .....  $I_{IN}=100\text{nA}(\text{typ.})$

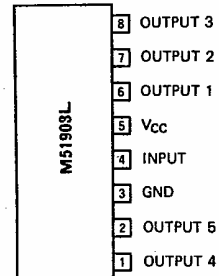
### APPLICATION

Signal meters, VU meters, tuning meters, and other general display applications

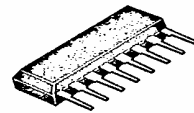
### RECOMMENDED OPERATING CONDITIONS

Supply voltage range ..... 4~18V  
 Rated supply voltage ..... 10V

### PIN CONFIGURATION (TOP VIEW)

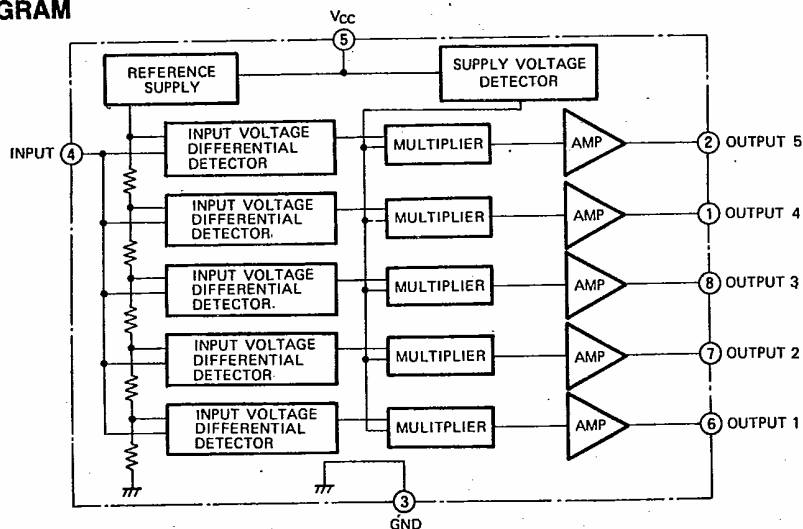


Outline 8P5



8-pin molded plastic SIP

### BLOCK DIAGRAM



## LED LINEAR LEVEL INDICATOR

### ABSOLUTE MAXIMUM RATINGS ( $T_a=25^\circ\text{C}$ , unless otherwise noted)

Symbol	Parameter	Conditions	Ratings	Unit
$V_{CC}$	Supply voltage		18	V
$V_{IN}$	Input voltage		6	V
$BV_o$	Output breakdown voltage		18	V
$I_o$	Output current		15 (per pin)	mA
$P_{dF}$	Power dissipation	With the M51903L soldered to a printed circuit board (copper-clad area $4.5 \times 5.5\text{cm}$ , thickness $35\mu$ , board thickness $2.0\text{mm}$ )	550	mW
$K_{\theta F}$	Derating	$T_a \geq 25^\circ\text{C}$	5.5	mW/°C
$T_{opg}$	Operating temperature		-20 ~ +75	°C
$T_{stg}$	Storage temperature		-40 ~ +125	°C

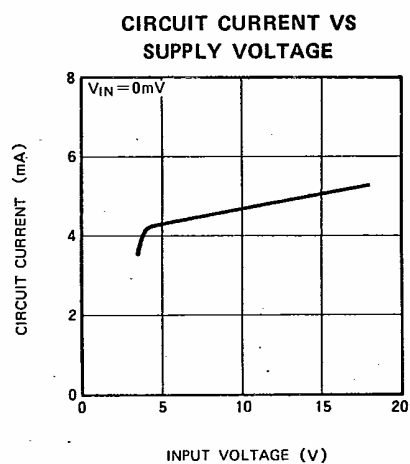
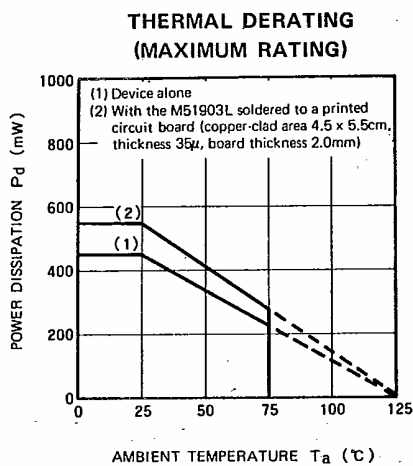
### ELECTRICAL CHARACTERISTICS ( $T_a=25^\circ\text{C}$ , $V_{CC}=\pm 10\text{V}$ , unless otherwise noted)

Symbol	Parameter	Test conditions	Limits			Unit
			Min	Typ	Max	
$V_{CC}$	Supply voltage range		4	10	18	V
$V_{INF}$	Fullscale input voltage			1320		mV
$V_{step}$	Step voltage			210		mV
$I_{IN}$	Input current	$V_{IN}=0\text{V}$ (Note 1)		0.1	1.0	$\mu\text{A}$
$I_{CC}$	Circuit current	$V_{IN}=0\text{V}$		5	8	mA
$V_{IT1}$	Output 1 LED drive voltage	$R_L = 1.5\text{k}\Omega$ $I_L = 100\mu\text{A}$ Using red GaAlAs LEDs	170	230	300	mV
$V_{IT2}$	Output 2 LED drive voltage		380	450	530	mV
$V_{IT3}$	Output 3 LED drive voltage		580	660	730	mV
$V_{IT4}$	Output 4 LED drive voltage		780	860	940	mV
$V_{IT5}$	Output 5 LED drive voltage		980	1070	1180	mV

Note 1. Current flowing from pin ④ is taken as positive current.

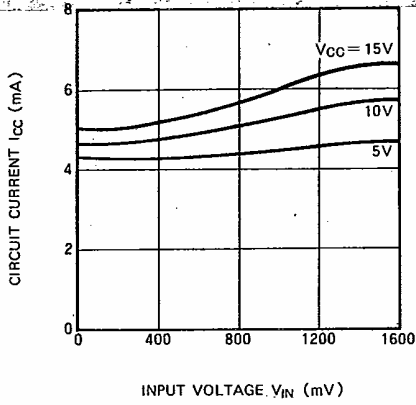
### TYPICAL CHARACTERISTICS ( $T_a = 25^\circ\text{C}$ , $V_{CC} = 10\text{V}$ unless otherwise noted)

(For the following typical characteristics,  $R_L$  in the application example (1) is  $1.5\text{k}\Omega$  and red GaAlAs LEDs are used for measurements)

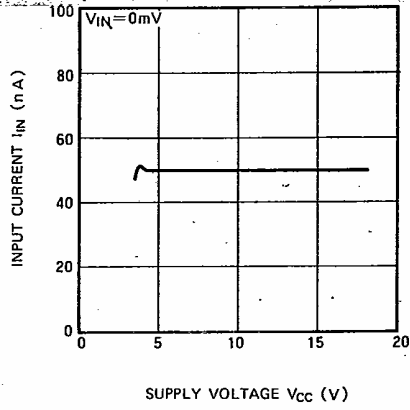


# LED LINEAR LEVEL INDICATOR

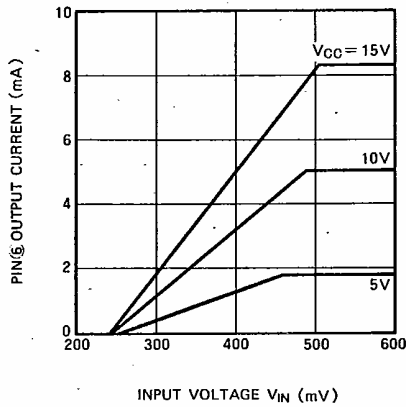
**CIRCUIT CURRENT VS INPUT VOLTAGE**



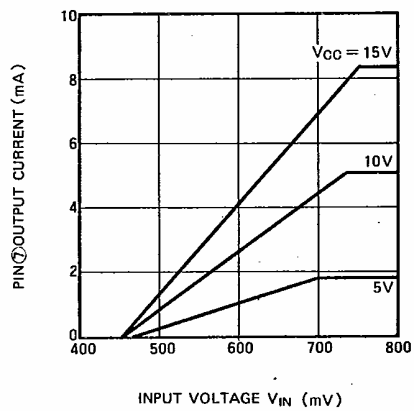
**INPUT CURRENT VS SUPPLY VOLTAGE**



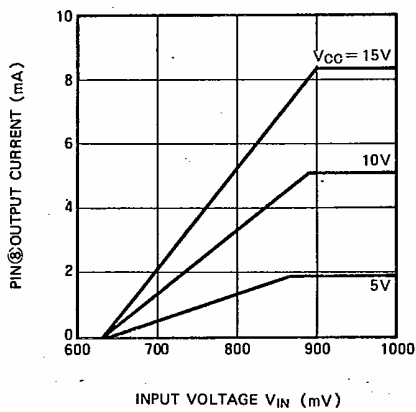
**PIN ⑥ OUTPUT CURRENT VS INPUT VOLTAGE**



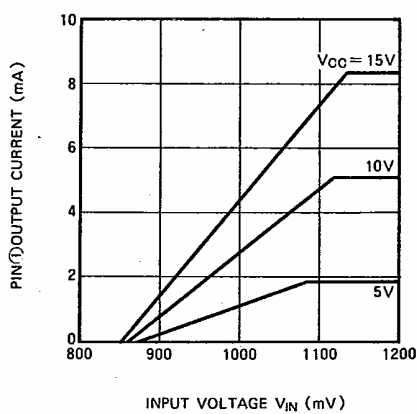
**PIN ⑦ OUTPUT CURRENT VS INPUT VOLTAGE**



**PIN ⑧ OUTPUT CURRENT VS INPUT VOLTAGE**

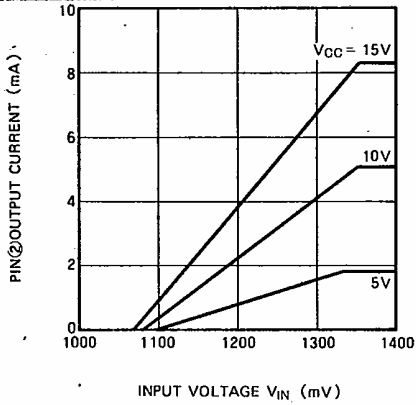


**PIN ① OUTPUT CURRENT VS INPUT VOLTAGE**

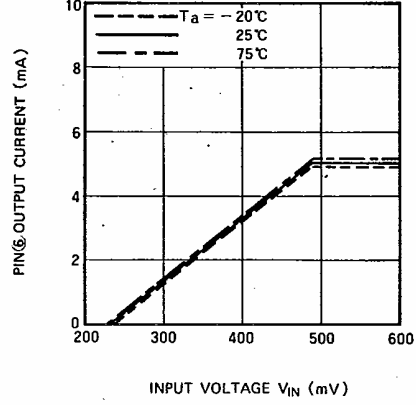


**LED LINEAR LEVEL INDICATOR**

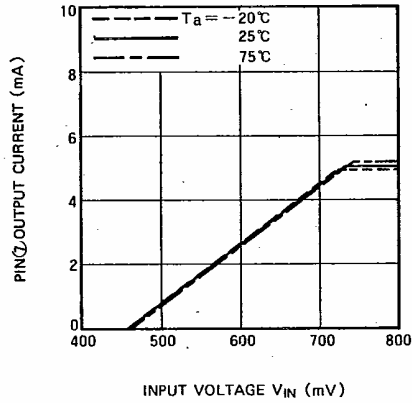
**PIN ② OUTPUT CURRENT VS INPUT VOLTAGE**



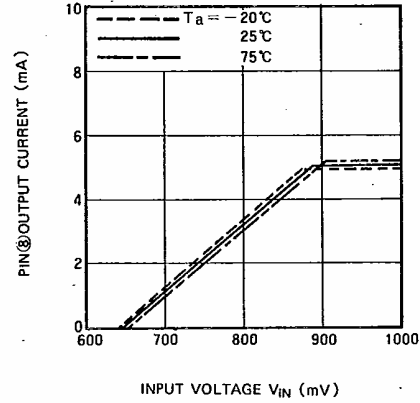
**PIN ⑥ OUTPUT CURRENT VS INPUT VOLTAGE TEMPERATURE CHARACTERISTICS**



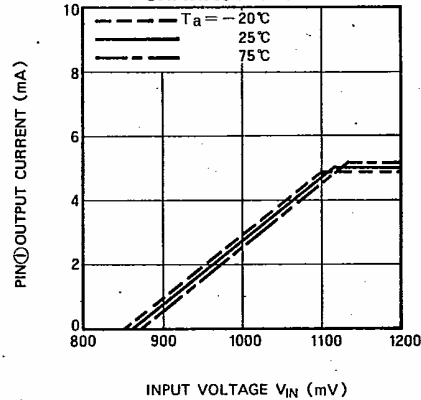
**PIN ⑦ OUTPUT CURRENT VS INPUT VOLTAGE TEMPERATURE CHARACTERISTICS**



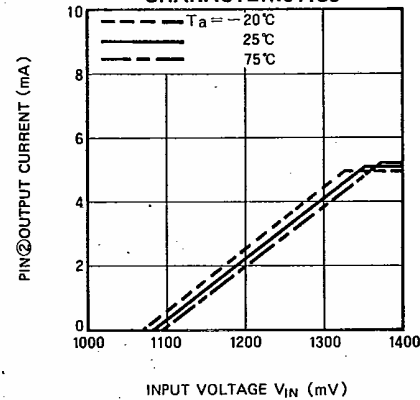
**PIN ⑧ OUTPUT CURRENT VS INPUT VOLTAGE TEMPERATURE CHARACTERISTICS**



**PIN ① OUTPUT CURRENT VS INPUT VOLTAGE TEMPERATURE CHARACTERISTICS**

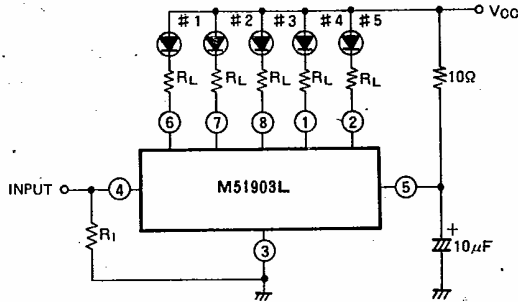


**PIN ② OUTPUT CURRENT VS INPUT VOLTAGE TEMPERATURE CHARACTERISTICS**



APPLICATION EXAMPLES

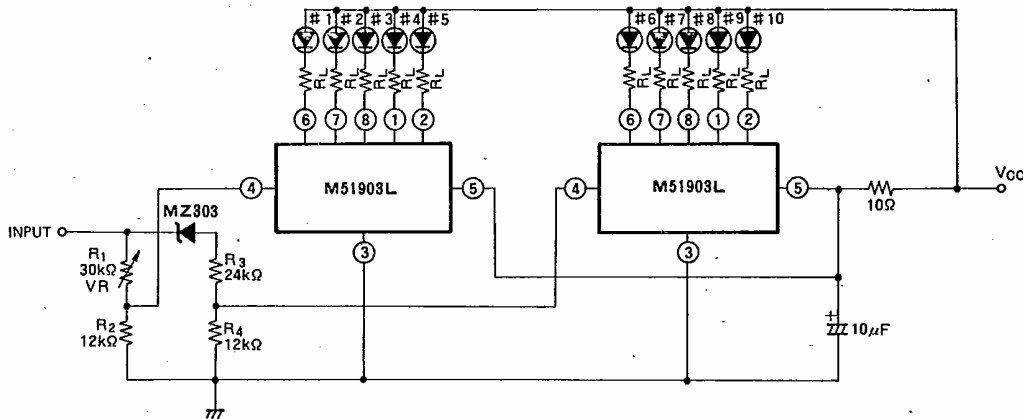
(1) M51903L used alone



Note 1. The value of  $R_L$  is chosen to suit the LED devices to be used. The maximum LED current  $\pm (V_{CC} - \text{LED forward voltage drop} - 1.0) / R_L \leq 15\text{mA}$

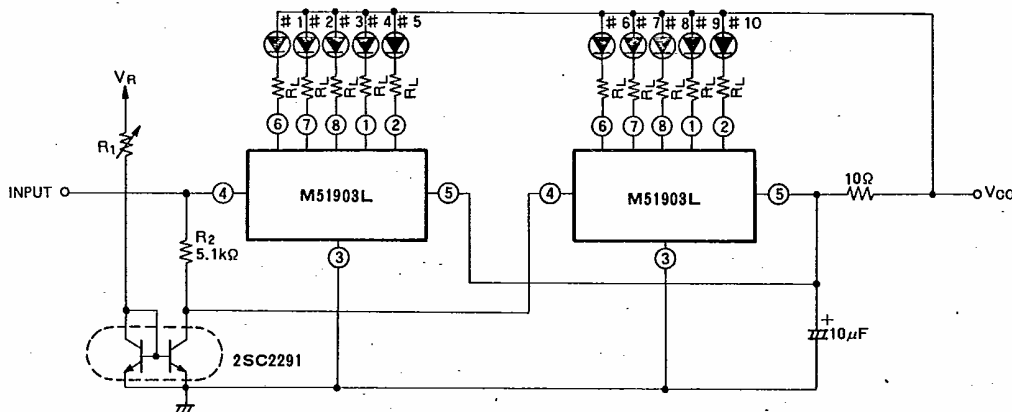
(2) M51903L used in cascade connection

(i) Circuit for a maximum input voltage of 7V



Note 1. Resistance  $R_1$  is selected so that the turn-on voltage for LED #6 is approximately 630mV higher than that of LED #5.

(3) Circuit for a maximum input voltage of 2.3V



Note 1. Resistance  $R_1$  selected so that the turn-on voltage for LED #6 is approximately 210mV higher than that of LED #5.