

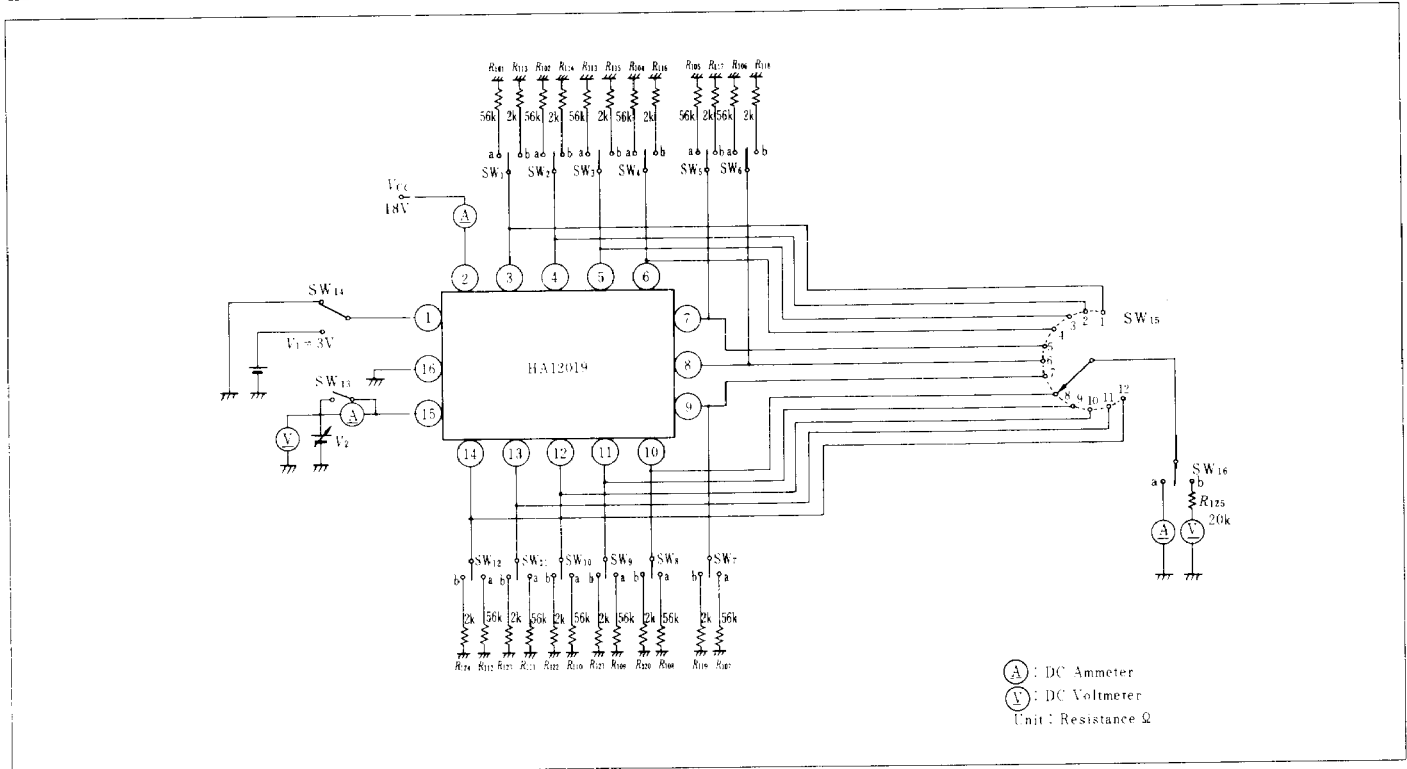
## ELECTRICAL CHARACTERISTICS

Item	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Pin-14 Threshold Voltage (+8dB)	$V_{th\ 14}$	$V_{in}$ under 15V of pin-14 Voltage	—	3.77	—	V
Pin-13 Threshold Voltage (+5dB)	$V_{th\ 13}$	$V_{in}$ under 15V of pin-13 Voltage	—	2.67	—	V
Pin-12 Threshold Voltage (+3dB)	$V_{th\ 12}$	$V_{in}$ under 15V of pin-12 Voltage	—	2.12	—	V
Pin-11 Threshold Voltage (+1dB)	$V_{th\ 11}$	$V_{in}$ under 15V of pin-11 Voltage	—	1.68	—	V
Pin-10 Threshold Voltage (0dB)	$V_{th\ 10}$	$V_{in}$ under 15V of pin-10 Voltage	1.27	1.50	1.75	V
Pin-9 Threshold Voltage (-1dB)	$V_{th\ 9}$	$V_{in}$ under 15V of pin-9 Voltage	—	1.34	—	V
Pin-8 Threshold Voltage (-3dB)	$V_{th\ 8}$	$V_{in}$ under 15V of pin-8 Voltage	—	1.06	—	V
Pin-7 Threshold Voltage (-5dB)	$V_{th\ 7}$	$V_{in}$ under 15V of pin-7 Voltage	—	0.84	—	V
Pin-6 Threshold Voltage (-7dB)	$V_{th\ 6}$	$V_{in}$ under 15V of pin-6 Voltage	—	0.67	—	V
Pin-5 Threshold Voltage (-10dB)	$V_{th\ 5}$	$V_{in}$ under 15V of pin-5 Voltage	—	0.47	—	V
Pin-4 Threshold Voltage (-15dB)	$V_{th\ 4}$	$V_{in}$ under 15V of pin-4 Voltage	—	0.27	—	V
Pin-3 Threshold Voltage (-20dB)	$V_{th\ 3}$	$V_{in}$ under 15V of pin-3 Voltage	—	0.15	—	V
Pin-14 Indicating Deviation	$V_{th(+8dB)}$	$V_{th\ 14}/V_{th\ 10}$	+7.4	+8.0	+8.6	dB
Pin-13 Indicating Deviation	$V_{th(+5dB)}$	$V_{th\ 13}/V_{th\ 10}$	+4.5	+5.0	+5.5	dB
Pin-12 Indicating Deviation	$V_{th(+3dB)}$	$V_{th\ 12}/V_{th\ 10}$	+2.6	+3.0	+3.4	dB
Pin-11 Indicating Deviation	$V_{th(+1dB)}$	$V_{th\ 11}/V_{th\ 10}$	+0.6	+1.0	+1.4	dB
Pin-9 Indicating Deviation	$V_{th(-1dB)}$	$V_{th\ 9}/V_{th\ 10}$	-1.4	-1.0	-0.6	dB
Pin-8 Indicating Deviation	$V_{th(-3dB)}$	$V_{th\ 8}/V_{th\ 10}$	-3.4	-3.0	-2.6	dB
Pin-7 Indicating Deviation	$V_{th(-5dB)}$	$V_{th\ 7}/V_{th\ 10}$	-5.5	-5.0	-4.5	dB
Pin-6 Indicating Deviation	$V_{th(-7dB)}$	$V_{th\ 6}/V_{th\ 10}$	-7.6	-7.0	-6.4	dB
Pin-5 Indicating Deviation	$V_{th(-10dB)}$	$V_{th\ 5}/V_{th\ 10}$	-10.8	-10.0	-9.2	dB
Pin-4 Indicating Deviation	$V_{th(-15dB)}$	$V_{th\ 4}/V_{th\ 10}$	-16.0	-15.0	-14.0	dB
Pin-3 Indicating Deviation	$V_{th(-20dB)}$	$V_{th\ 3}/V_{th\ 10}$	-23.0	-20.0	-17.0	dB
Operating Current	$I_{CC}$	Pin-2 inflow current under 0V of $V_{in}$ at pin-14	—	8.0	14.3	mA
Input Outflow Current (pin-15)	$I_{IL}$	Outflow current under pin-15 GND	—	2.0	300	nA
Output High-Voltage (pins 3~14)	$V_{OH-n}$	$V_{CC}=12V$ , $R_L=2k\Omega$ , $V_{in}=4.5V$ Measure output voltage at pin ( $n=3\sim14$ )	7.7	9.5	—	V
Output Leak Current	$I_{OL-n}$	$V_{in}=0V$ , Measure leak current at pin ( $n=3\sim14$ )	—	0.01	2	$\mu A$
Output Low-Voltage at pin-3 under 3V-supplying to Ref. (pin-1).	$V_{OL\ 3}$	$V_{Ref}=3.0V$ , $V_{in}=3.0V$ Measure output voltage at pin-3	—	0.56	112	mV
Output High-Voltage at pin-14 under 3V-supplying to Ref. (pin-1).	$V_{OH\ 14}$	$V_{Ref}=3.0V$ , $V_{in}=7.5V$ Measure output voltage at pin-14	16.0	17.3	—	V

Note) Unless otherwise specified, testing conditions are:  $V_{CC}=18V$ .

$R_L$  (Load Resistance at pins 3~14)=56k $\Omega$ , pin-1=GND

■ TEST CIRCUIT



● OPERATING PRINCIPLE

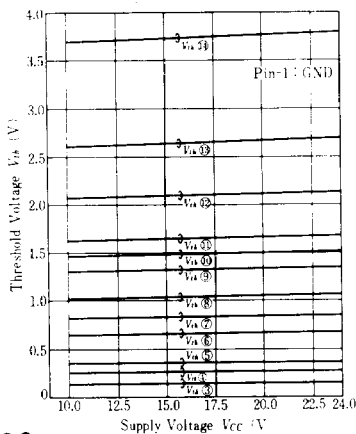
HITACHI HA12019 contains twelve voltage comparators as the diagram shows. Internal standard voltage which corresponds to each step is supplied to the each comparator. When input DC voltage is higher than internal standard voltage, fluorescent display tube operates with high-level output of fluorescent display tube driver connected to voltage comparator output.

■ OPERATION WITH  $V_{Ref}$  SUPPLIED

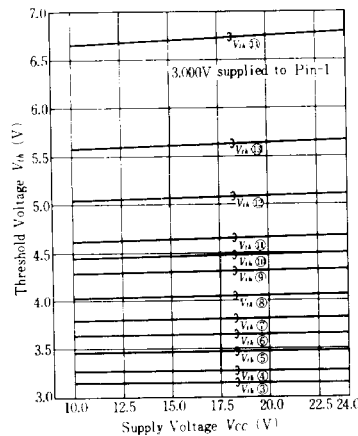
HITACHI HA12019 is able to change the threshold voltage of pins 3~14 by supplying reference voltage ( $V_{Ref}$ ) to pin-1. Threshold voltage at pins 3~14 with  $V_{Ref}$  supplied is calculated as follows.

$$\left( \text{Threshold Voltage at pin-n with } V_{Ref} \text{ supplied} \right) = \left( \text{Threshold Voltage at pin-n with pin-1 grounded} \right) + V_{Ref}$$

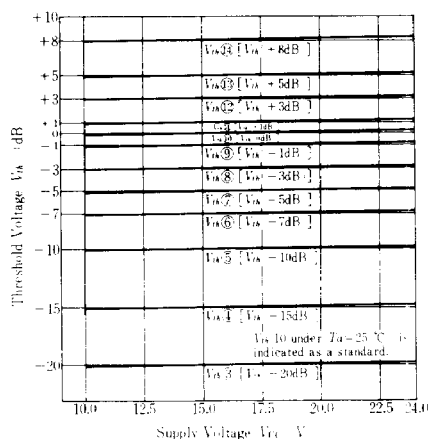
THRESHOLD VOLTAGE ③~⑭ VS. SUPPLY VOLTAGE (1)



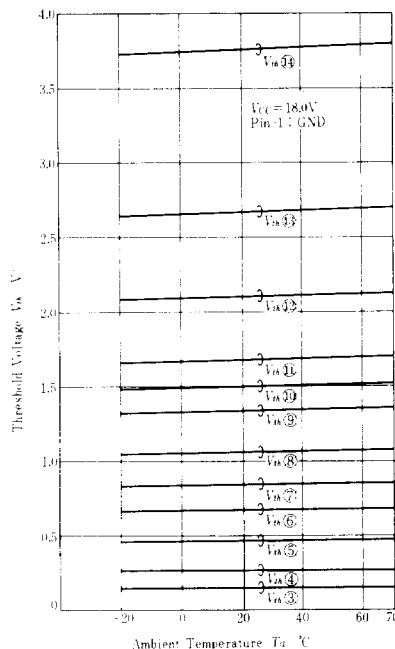
THRESHOLD VOLTAGE ③~⑭ VS. SUPPLY VOLTAGE (2)



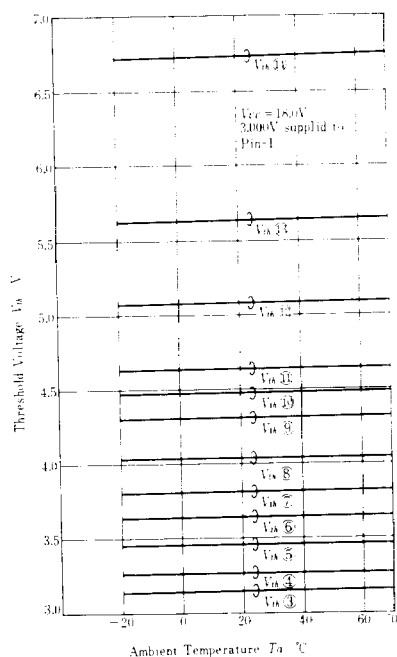
**THRESHOLD VOLTAGE ③~⑭ VS. SUPPLY VOLTAGE (3)**



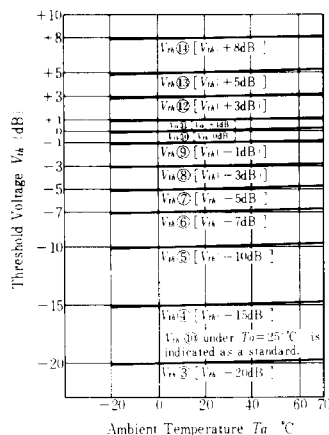
**THRESHOLD VOLTAGE ③~⑭ VS. AMBIENT TEMPERATURE (1)**



**THRESHOLD VOLTAGE ③~⑭ VS. AMBIENT TEMPERATURE (2)**



**THRESHOLD VOLTAGE ③~⑭ VS. AMBIENT TEMPERATURE (3)**



**OUTPUT HIGH-VOLTAGE AND OPERATING CURRENT VS. AMBIENT TEMPERATURE**

