

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

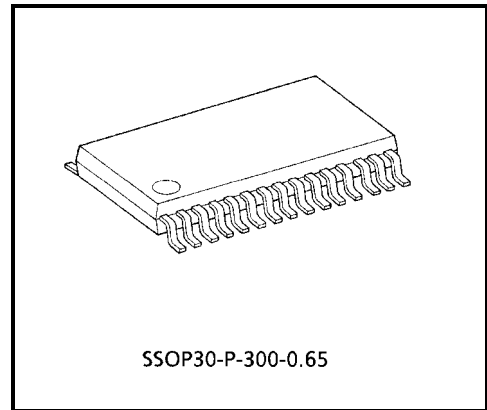
# TA8482FN

BRIDGE DRIVER + SENSOR AMP 1-CHIP IC FOR DC MOTORS

TA8482FN is a loading motor driver for video camera. It is a 1-chip IC with tape top / end sensor amplifiers, reel FG amplifiers, and buffer amplifiers for servo error L.P.F.

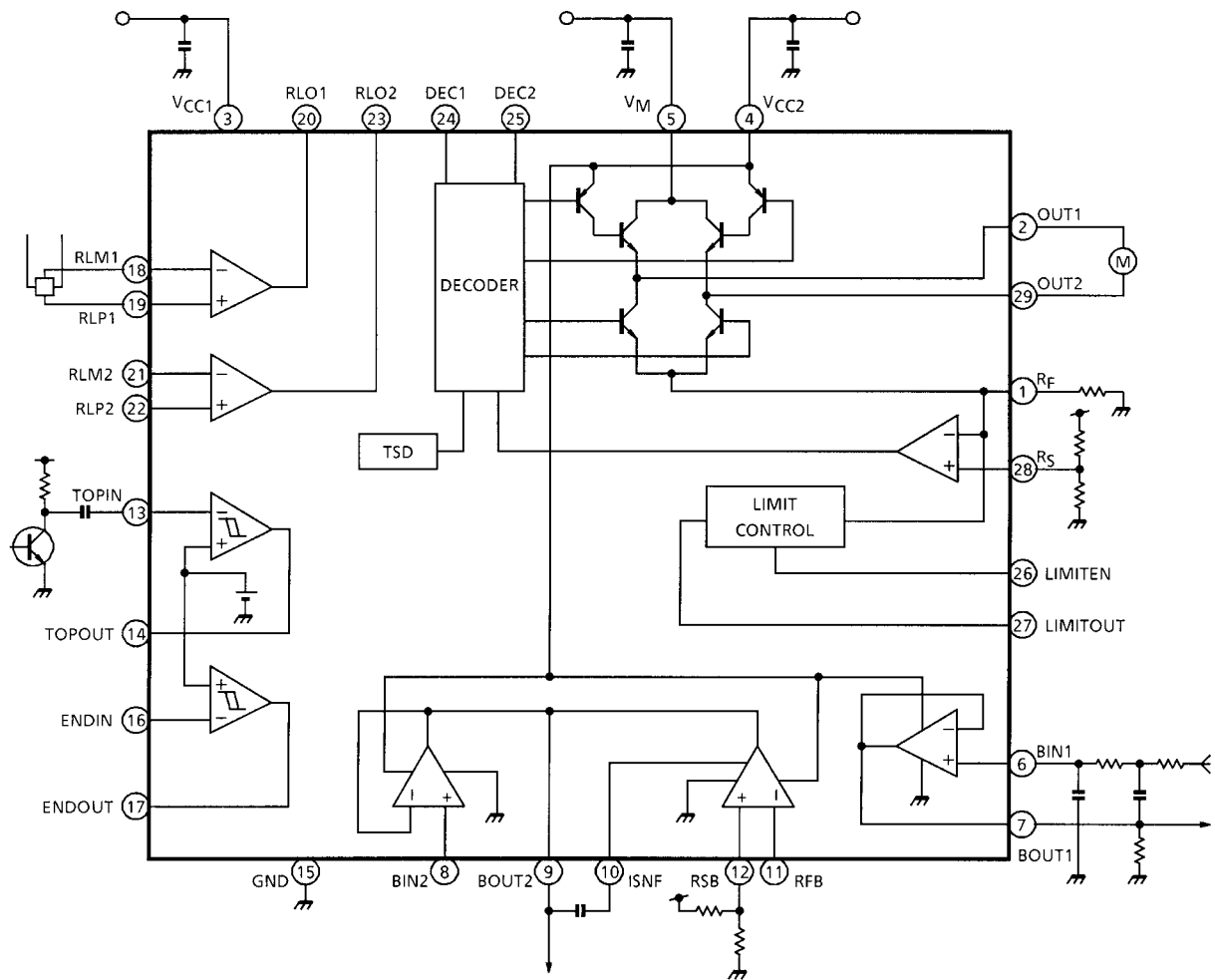
## FEATURES

- 4 Modes : Forward Rotation, Reverse Rotation, Stop, and Brake
- Built-in Current Limiter
- Built-in Thermal Shutdown Circuit
- Built-in Tape Top / End Sensor Amplifiers
- 2 Built-in Reel FG Amplifiers
- 2 Built-in Buffer Amplifiers for Servo Error L.P.F.
- Built-in Buffer Limiter
- Package : VSOP-30



Weight: 0.17 g (Typ.)

## BLOCK DIAGRAM



## PIN FUNCTION

PIN No.	SYMBOL	PIN NAME
1	R <sub>F</sub>	Output current detect pin
2	OUT1	Motor drive output pin 1
3	V <sub>CC1</sub>	Power supply input pin 1
4	V <sub>CC2</sub>	Power supply input pin 2
5	V <sub>M</sub>	Motor drive voltage input pin
6	BIN1	Buffer amp 1 input pin
7	BOUT1	Buffer amp 1 output pin
8	BIN2	Buffer amp 2 input pin
9	BOUT2	Buffer amp 2 output pin
10	ISNF	Buffer limiter amp phase compensating pin
11	RFB	Buffer limiter amp input pin
12	RSB	Buffer limiter amp reference voltage input pin
13	TOPIN	Tape-top sensor amp input pin
14	TOPOUT	Tape-top sensor output pin
15	GND	GND pin
16	ENDIN	Tape-end sensor amp input pin
17	ENDOUT	Tape-end sensor amp output pin
18	RLM1	Reel FG amp 1 negative side input pin
19	RLP1	Reel FG amp 1 positive side input pin
20	RLO1	Reel FG amp 1 output pin
21	RLM2	Reel FG amp 2 negative side input pin
22	RLP2	Reel FG amp 2 positive side input pin
23	RLO2	Reel FG amp 2 output pin
24	DEC1	Decoder input pin 1
25	DEC2	Decoder input pin 2
26	LIMITEN	Limiter controller input pin
27	LIMITOUT	Limiter controller output pin
28	R <sub>S</sub>	Limiter amp reference voltage input pin
29	OUT2	Motor drive output pin 2
30	N.C	—

## TRUTH TABLE

### DECODER CIRCUIT

DEC1	DEC2	OUT1	OUT2
L	L	Z	Z
H	L	H	L
L	H	L	H
H	H	L	L

Z: High impedance

### LIMITER CONTROLLER CIRCUIT

LIMITEN	LIMITER AMP CIRCUIT	LIMITOUT
H	When operated (when output current is detected)	L
	When not operated	H
L	H	

## MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Small Signal Section Supply Voltage	V <sub>CC1</sub>	10	V
Output Section Supply Voltage	V <sub>CC2</sub>	11	V
Output Section Supply Voltage	V <sub>M</sub>	8	V
Output Current	I <sub>O</sub>	0.6	A
Power Dissipation	P <sub>D</sub>	0.86 (Note 1)	W
		1.13 (Note 2)	
Operating Temperature	T <sub>opr</sub>	-20~80	°C
Storage Temperature	T <sub>stg</sub>	-55~150	°C

Note 1: Single body

Note 2: Substrate mounting (50 × 50 × 1.6 mm Cu 40%)

\*: Devices may break outside the range of maximum rating.

## OPERATING SUPPLY VOLTAGE RANGE (Ta = 25°C)

CHARACTERISTIC	SYMBOL	OPERATING RANGE	UNIT
Small Signal Section Supply Voltage	V <sub>CC1</sub>	2.7~4.0	V
Output Section Supply Voltage	V <sub>CC2</sub>	V <sub>CC1</sub> ~9.0	V
Output Section Supply Voltage	V <sub>M</sub>	1.0~7.0 (Note 3)	V

Note 3: V<sub>CC2</sub> ≥ V<sub>M</sub>

\*: The range of operating conditions covers normal operations under the condition specified for electrical characteristics.

## ELECTRICAL CHARACTERISTICS

( $V_{CC1} = 3.0\text{ V}$ ,  $V_{CC2} = 4.75\text{ V}$ ,  $V_M = 3.0\text{ V}$ ,  $T_a = 25^\circ\text{C}$ )

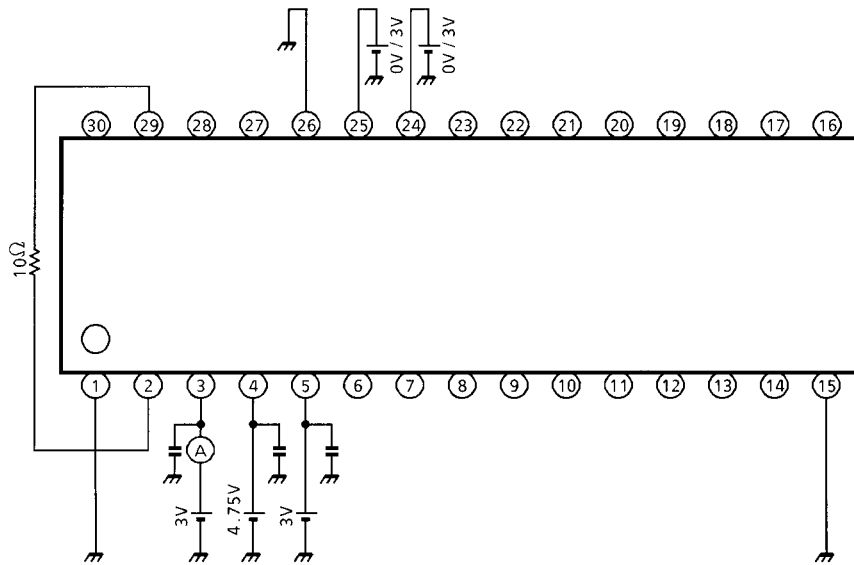
CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITIONS	MIN	TYP.	MAX	UNIT		
Supply Current		$I_{CC11}$	1	$R_L = 10\ \Omega$ DEC1 : L, DEC2 : L	—	3	4.2	mA		
		$I_{CC12}$		$R_L = 10\ \Omega$ DEC1 : H / L, DEC2 : L / H	—	20	30			
		$I_{CC13}$		$R_L = 10\ \Omega$ DEC1 : H, DEC2 : H	—	42	60			
				$I_{CC21}$	2	$R_L = 10\ \Omega$ , $V_{CC1} = 0\text{ V}$ DEC1 : L, DEC2 : L	—	—	1	$\mu\text{A}$
				$I_{CC22}$		$R_L = 10\ \Omega$ DEC1 : L, DEC2 : L	—	0.7	1	mA
				$I_{CC23}$		$R_L = 10\ \Omega$ DEC1 : H / L, DEC2 : L / H	—	20	30	
				$I_{CC24}$		$R_L = 10\ \Omega$ DEC1 : H, DEC2 : H	—	0.7	1	
		$I_M$	3	$R_L = 10\ \Omega$ DEC1 : L, DEC2 : L	—	—	1	$\mu\text{A}$		
Decoder Circuit	Input Voltage	"H" level	4	$R_L = 10\ \Omega$	2.0	—	—	V		
		"L" level		$R_L = 10\ \Omega$	—	—	0.6			
	Input Current			$I_{IN}$	$V_{IN} = 3.0\text{ V}$	—	—	3	$\mu\text{A}$	
	Input Leakage Current			$I_{INL}$	$V_{IN} = 0\text{ V}$	—	—	1		
Output Circuit	Saturation Voltage (Upper Side + Lower Side)		5	$I_O = 0.2\text{ A}$	—	0.3	0.45	V		
				$I_O = 0.4\text{ A}$	—	0.6	0.75			
Current Limiter Amp	Reference Voltage Input Range		6		0.05	—	1.0	V		
	Detecting Voltage		7	$R_L = 10\ \Omega$ , $R_F = 1\ \Omega$ $V_{RS} = 0.2\text{ V}$	0.18	0.2	0.22			
Current Limiter Controller	Input Voltage	"H" level	8	$R_L = 10\ \Omega$	2.0	—	—	V		
		"L" level		$R_L = 10\ \Omega$	—	—	0.6			
	Input Current			$I_{LC}$	$V_{LE} = 3.0\text{ V}$	—	—	3	$\mu\text{A}$	
	Input Leakage Current			$I_{LCL}$	$V_{LE} = 0\text{ V}$	—	—	1		
	Output Voltage	"H" level		$V_{LO(H)}$	$I_O = 10\ \mu\text{A}$	$V_{CC1} - 0.5$	—	—	V	
		"L" level		$V_{LO(L)}$	$I_O = 10\ \mu\text{A}$	—	—	0.4		

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
Reel FG Amp	Common-Phase Voltage Range	$V_{CMRFG}$	9		1.0	—	2.0	V
	Input Current	$I_{FG}$	10	$V_{CMRFG} = 1.5\text{ V}$	—	—	1	$\mu\text{A}$
	Output Offset Voltage	$V_{OFFG}$			—	0	$\pm 290$	mV
	Closed Loop Voltage Gain	$G_{VFG}$	11	$f_{FG} = 1\text{ kHz}$	27	29	31	dB
	Open Loop Voltage Gain	$G_{VOFG}$	—	$f_{FG} = 1\text{ kHz}$ Design assurance	—	55	—	dB
	Output Residual Voltage	$V_{sat-FG (H)}$	12	$I_O = 10\ \mu\text{A}$ (Upper side)	—	—	0.2	V
$V_{sat-FG (L)}$		$I_O = 10\ \mu\text{A}$ (Lower side)		—	—	0.2		
Top/End Sensor Amp	Input Resistance	$R_{IN}$	13		4	5	6	$\text{k}\Omega$
	Minimum Input Sensitivity	$R_{HS}$	—	Design assurance	30	40	50	$\text{mV}_{p-p}$
Buffer Amp	Input voltage range	$V_{CMRB}$	14		0	—	$V_{CC2}$	V
	Input Current	$I_B$		$V_{BIN} = 0\text{ V}$ , (Note)	—	—	1	$\mu\text{A}$
	Input Offset Voltage	$V_{OFB}$		$V_{BIN} = 1.5\text{ V}$	—	0	$\pm 7$	mV
	Output Voltage (Upper Side)	$V_{OB(H)}$		$R_L = 20\ \text{k}\Omega$ (against GND)	$V_{CC2} - 1.7$	—	—	V
	Output voltage (Lower Side)	$V_{OB(L)}$	15	$V_{BOUT} = 0\text{ V}$ , $R_L = 500\ \text{k}\Omega$ (against $V_{CC2}$ )	—	—	0.1	V
	Band Width	$f_B$	—	Design assurance	—	800	—	kHz
Buffer Limiter Amp	Common-Phase Input Voltage Range	$V_{CMRBL}$	16		0	—	$V_{CC2} - 1.7$	V
	Input Current	$I_{BL}$	17	$V_{BL} = 0\text{ V}$	—	—	1	$\mu\text{A}$
	Input Offset Voltage	$V_{OFBL}$	18	$V_{RSB} = 1.5\text{ V}$	—	0	$\pm 7$	mV
Thermal Shutdown Circuit Operating Temperature		$T_{SD}$	—	Design assurance	—	150	—	$^{\circ}\text{C}$

Note: Design target value is fixed at 0.5 $\mu\text{A}$  (Max.)

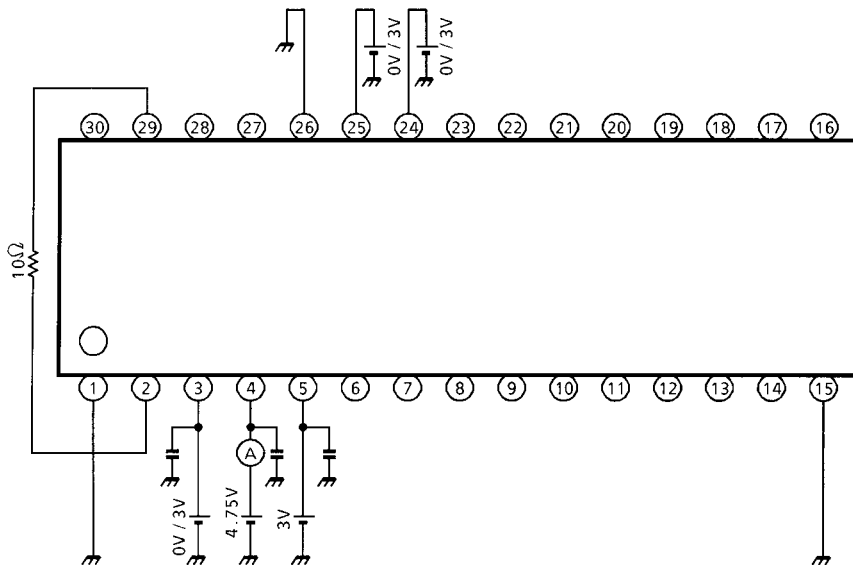
## TEST CIRCUIT 1

### 1. I<sub>CC1</sub>, I<sub>CC2</sub>, I<sub>CC3</sub>



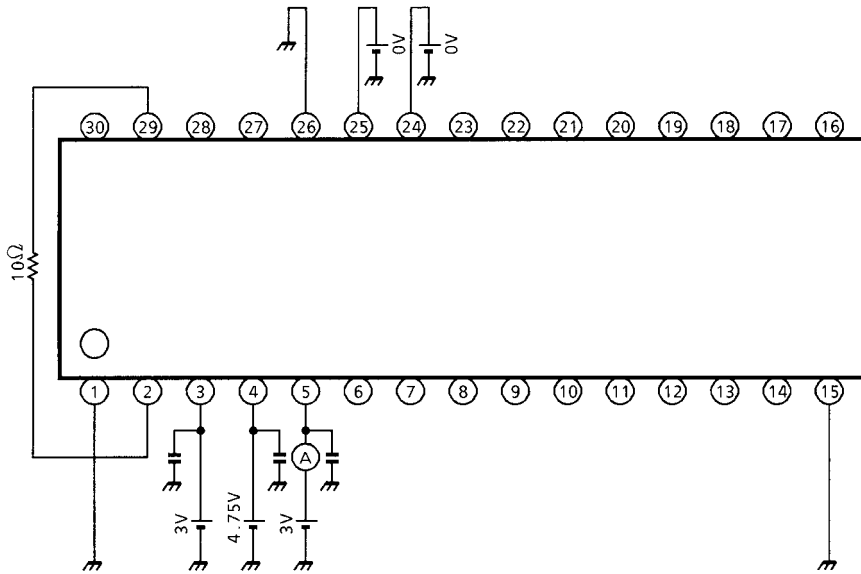
- I<sub>CC1</sub>  
DEC1 = L, DEC2 = L
- I<sub>CC2</sub>  
DEC1 = H, DEC2 = L  
and  
DEC1 = L, DEC2 = H
- I<sub>CC3</sub>  
DEC1 = H, DEC2 = H

### 2. I<sub>CC21</sub>, I<sub>CC22</sub>, I<sub>CC23</sub>, I<sub>CC24</sub>



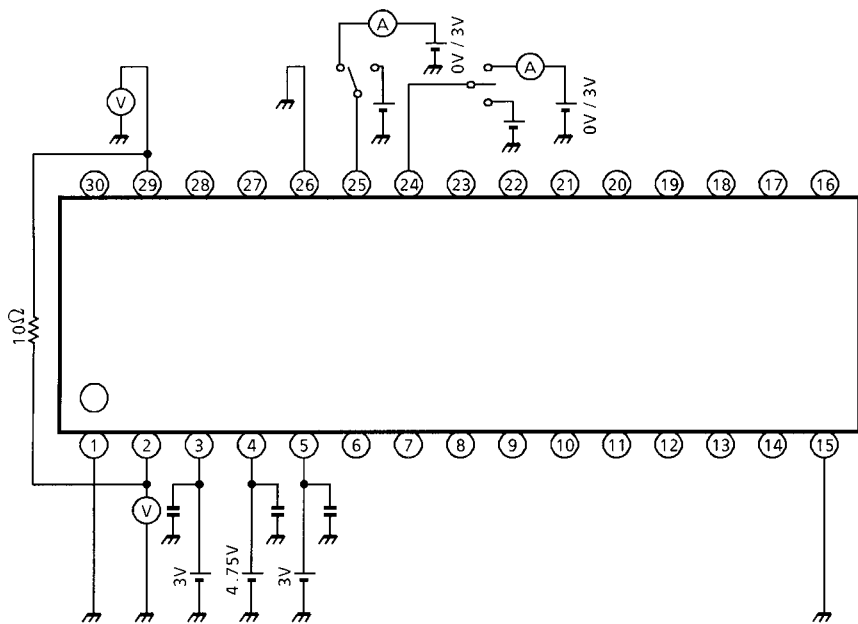
- I<sub>CC21</sub>  
V<sub>CC1</sub> = 0, DEC1 = L,  
DEC2 = L
- I<sub>CC22</sub>  
V<sub>CC1</sub> = 3 V, DEC1 = L,  
DEC2 = L
- I<sub>CC23</sub>  
DEC1 = H, DEC2 = L  
and  
DEC1 = L, DEC2 = H
- I<sub>CC24</sub>  
DEC1 = H, DEC2 = H

**3.  $I_M$**



- $I_M$   
DEC1 = L, DEC2 = L

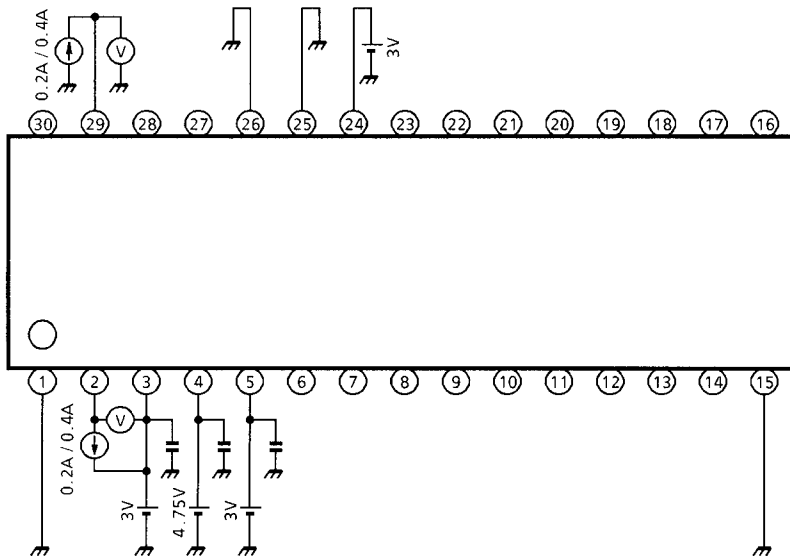
**4.  $V_{IN1}$ ,  $V_{IN2}$ ,  $I_{IN1}$ ,  $I_{INL}$**



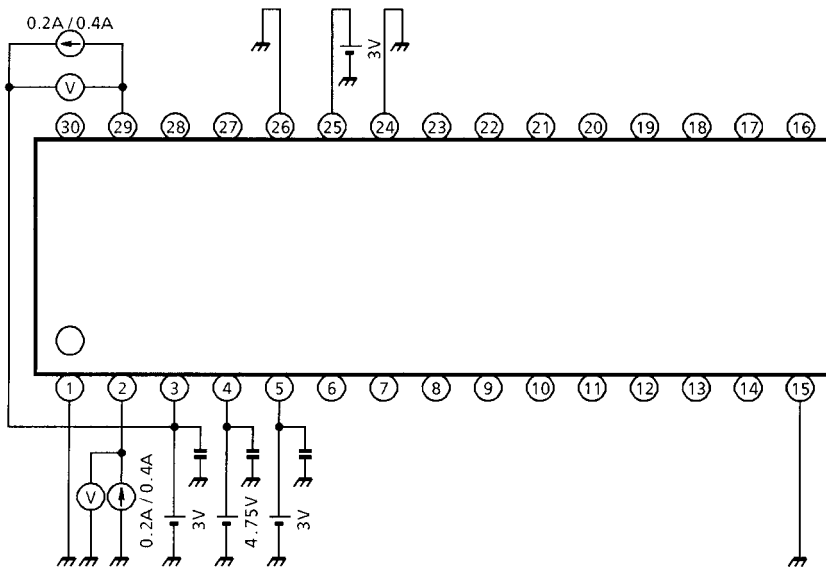
- $V_{IN1}$ ,  $V_{IN2}$   
 $V_{DEC1} = 0.6\text{ V}$ ,  $V_{DEC2} = 2.0\text{ V}$   
 $V_{DEC1} = 2.0\text{ V}$ ,  $V_{DEC2} = 0.6\text{ V}$   
 $V_{DEC1} = 2.0\text{ V}$ ,  $V_{DEC2} = 2.0\text{ V}$   
 Check the output functions on the above-mentioned three conditions.
- $I_{IN1}$   
 $V_{IN} = 3.0\text{ V}$
- $I_{INL}$   
 $V_{IN} = 0\text{ V}$



**5.  $V_{sat}$  (H+L)**



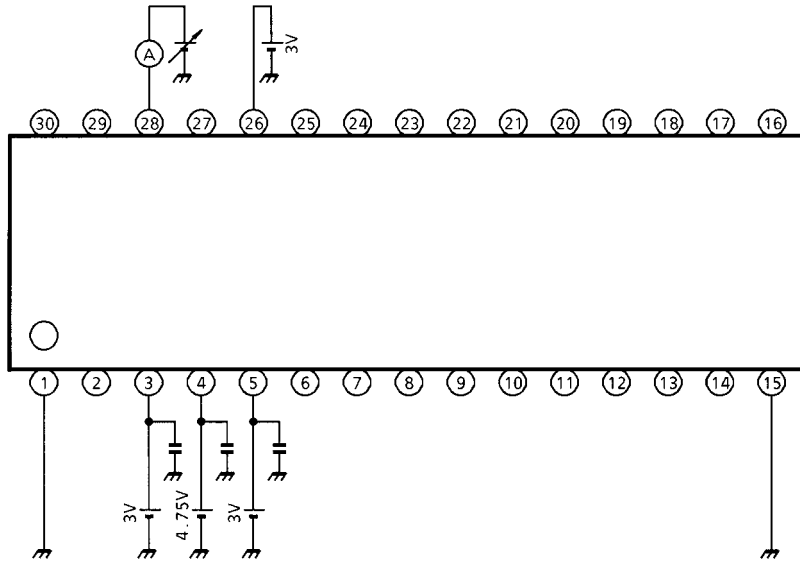
- $V_{sat}$  (H+L)  
Input DEC1 = H, DEC2 = L, and measure OUT1 (upper side) and OUT2 (lower side) with regard to  $I_O = 0.2\text{ A} / 0.4\text{ A}$ .



- $V_{sat}$  (H+L)  
Input DEC1 = H, DEC2 = L, and measure OUT1 (upper side) and OUT2 (lower side) with regard to  $I_O = 0.2\text{ A} / 0.4\text{ A}$ .

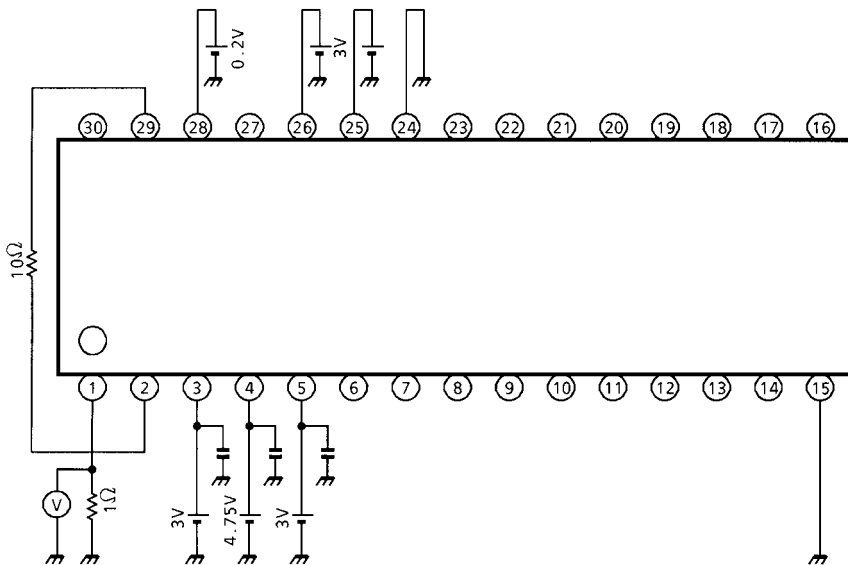
The sum of the upper / lower values of OUT1 and OUT2 is fixed at  $V_{sat}$  (H+L).

**6.  $V_{RS}$**



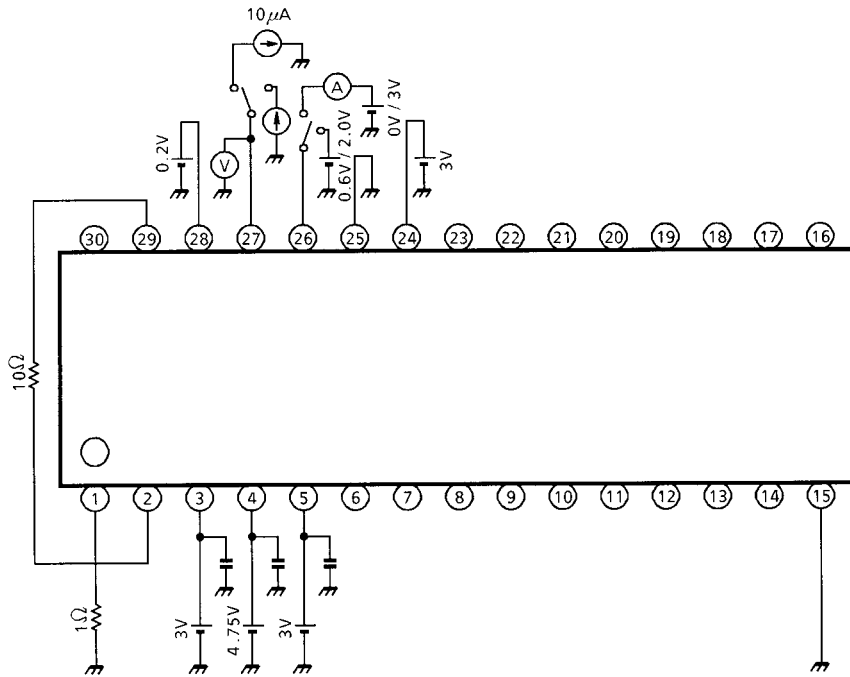
- $V_{RS}$   
Change  $V_{RS}$  and measure input current.

**7.  $V_{LIMIT}$**



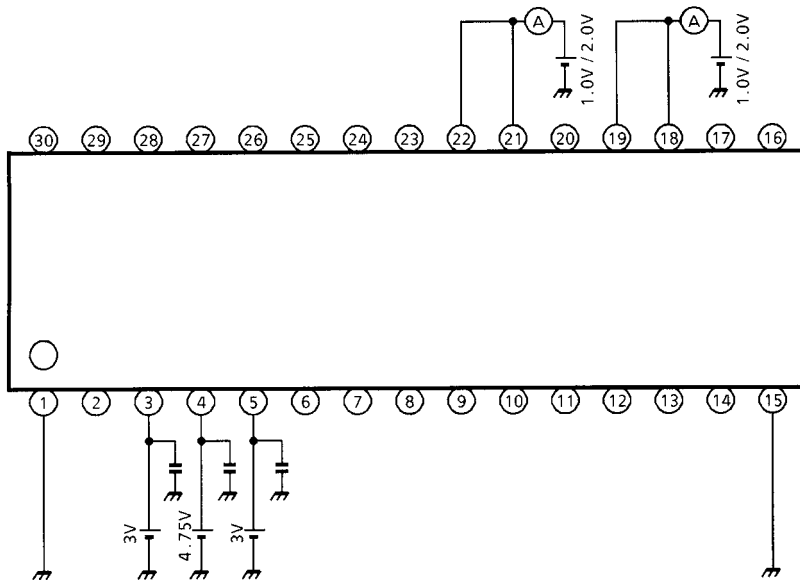
- $V_{LIMIT}$   
Input  $V_{RS} = 0.2\text{ V}$  and measure  $R_F (= 1\Omega)$  generating voltage at the time of limiter amp operation.

**8.  $V_{LE} (H)$ ,  $V_{LE} (L)$ ,  $I_{LC}$ ,  $I_{LCL}$ ,  $V_{LO} (H)$ ,  $V_{LO} (L)$**

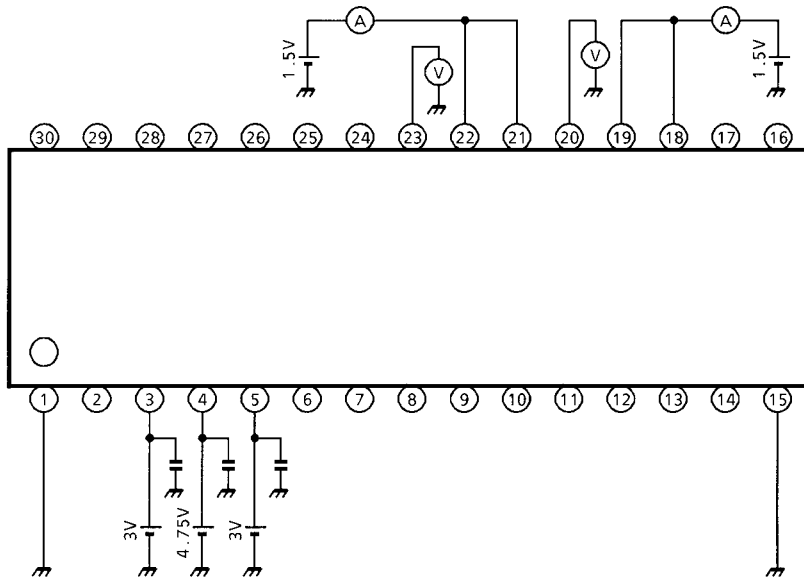


- $V_{LE} (H)$ ,  $V_{LE} (L)$   
Input  $V_{LE} = 2.0 \text{ V} / 0.6 \text{ V}$  in a limiter amp operating state and check the LIMIT OUT terminal voltage.
- $I_{LC}$   
 $V_{LE} = 3.0 \text{ V}$
- $I_{LCL}$   
 $V_{LE} = 0 \text{ V}$
- $V_{LO} (H)$ ,  $V_{LO} (L)$   
Input  $V_{LE} = 0.6 \text{ V} / 2.0 \text{ V}$  in a limiter amp operating state and measure the LIMIT OUT terminal voltage when  $I_O = 10 \mu\text{A}$ .

**9.  $V_{CMRFG}$**



**10. I<sub>FG</sub>, V<sub>OFFG</sub>**



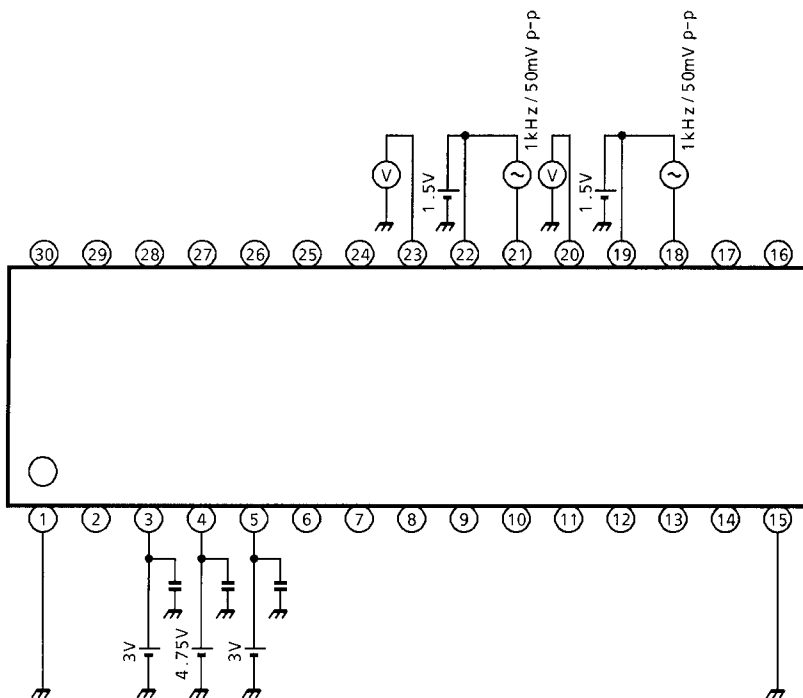
- I<sub>FG</sub>  
Measure the input current (I<sub>FG'</sub>) when V<sub>CMRFG</sub> = 1.5 V, and calculate the following formula:

$$I_{FG} = \frac{1}{2} \times I_{FG'}$$

- V<sub>OFFG</sub>  
Measure the R<sub>LO</sub> pin output voltage when V<sub>CMRFG</sub> = 1.5 V, and calculate the following formula :

$$V_{OFFG} = V_{RLO} - 1.5$$

**11. G<sub>VFG</sub>**

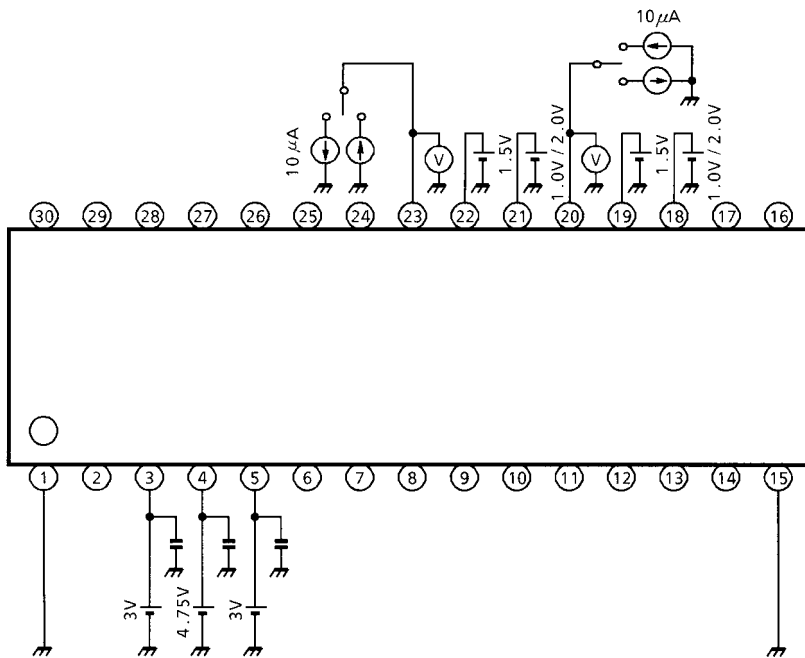


- G<sub>VFG</sub>  
V<sub>RLP</sub> = 1.5 V, input signals

f<sub>FG</sub> = 1 kHz, V<sub>FG</sub> = 50 mV<sub>p-p</sub> between R<sub>LP</sub> and R<sub>LM</sub>, and measure V<sub>RLO</sub> in this case.

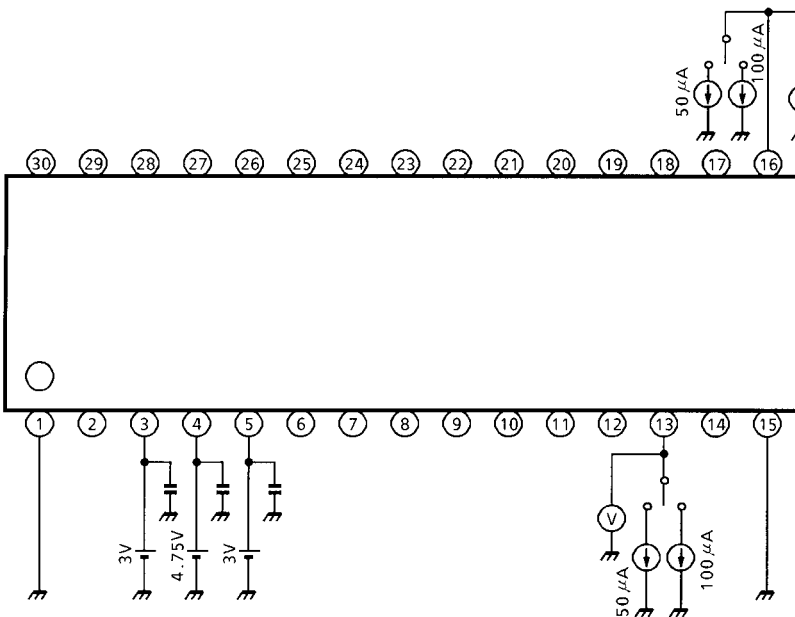
$$GVFG = 20 \log \frac{V_{RLO}}{0.05} \text{ [dB]}$$

12.  $V_{sat-FG(H)}$ ,  $V_{sat-FG(L)}$



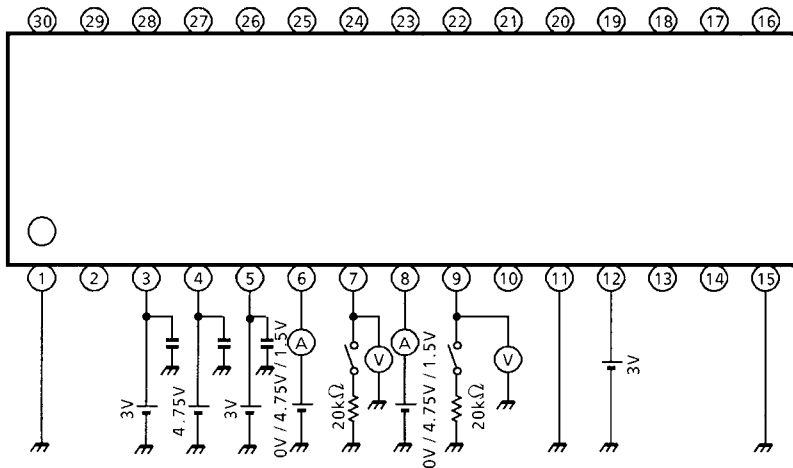
- $V_{sat-FG(H)}$   
Input  $V_{RLP} = 1.5V$ ,  $V_{RLM} = 1.0V$ , measure the  $R_{LO}$  pin voltage when  $I_O = 10\mu A$  (source current), and calculate the following formula:  
 $V_{sat-FG(H)} = 3.0 - V_{RLO} [V]$
- $V_{sat-FG(L)}$   
Input  $V_{RLP} = 1.5V$ ,  $V_{RLM} = 2.0V$  and measure the  $R_{LO}$  pin voltage when  $I_O = 10\mu A$  (sink current).

13.  $R_{IN}$



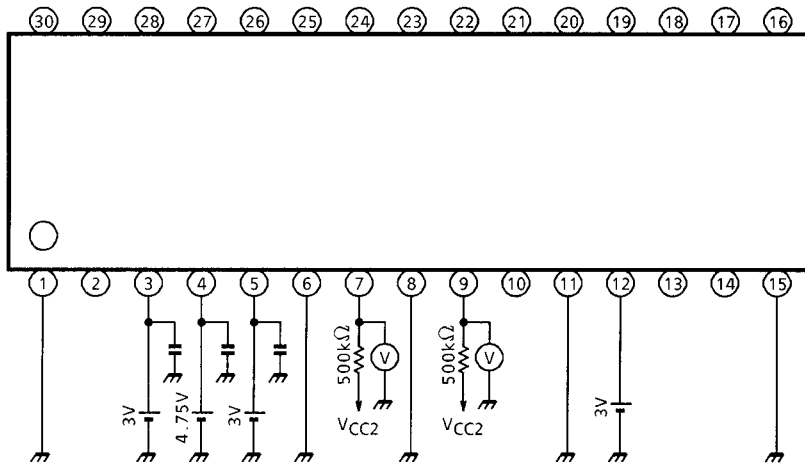
- $R_{IN}$   
Measure the  $V_{TOPIN}$ ,  $V_{ENDIN}$  at the time  $50\mu A / 100\mu A$  current flows from  $TOPIN / ENDIN$  pin, and calculate the following formula :  
$$R_{IN} = \frac{V(50\mu A) - V(100\mu A) - 0.007}{50\mu A} [\Omega]$$
- \* The 7 mV in the formula represents the  $V_{BE}$  change of the internal  $Tr$ . at the time of  $50\mu A / 100\mu A$ .

**14.  $V_{CMRB}$ ,  $I_B$ ,  $V_{OB}$  (H)**

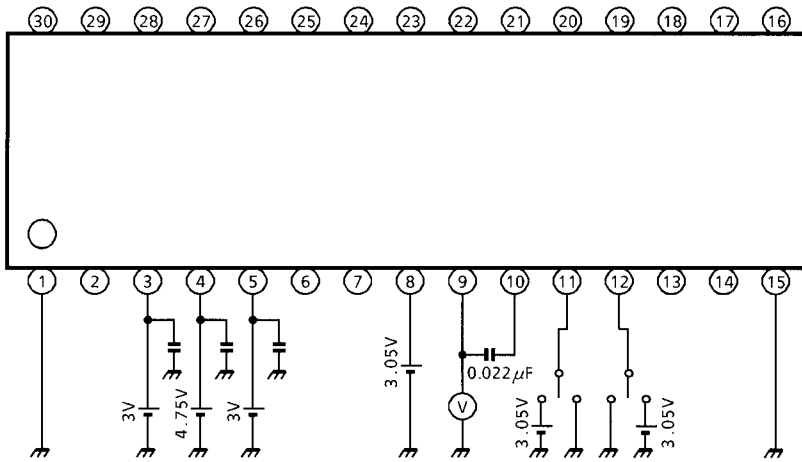


- $V_{CMRB}$   
Input  $V_{BIN} = 0\text{ V} / 4.75\text{ V}$  and measure BOUT pin voltage.
- $I_B$   
 $V_{BIN} = 1.5\text{ V}$
- $V_{OB}$  (H)  
Input  $V_{BIN} = 4.75\text{ V}$  and connect  $20\text{ k}\Omega$  (against GND) to BOUT pin.

**15.  $V_{OB}$  (L)**

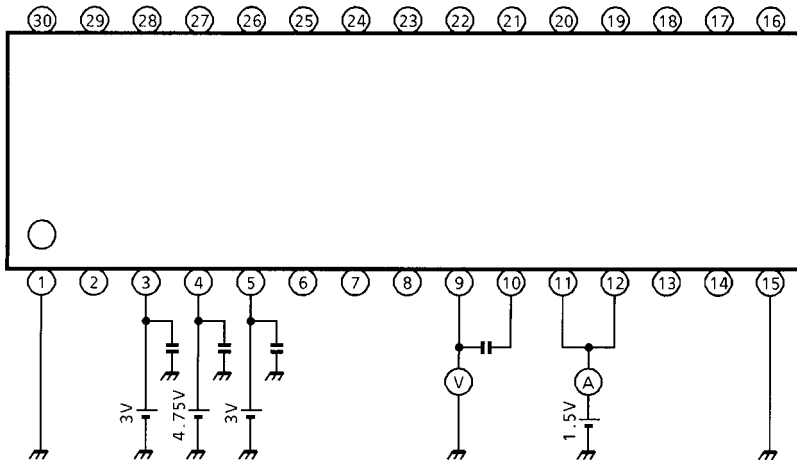


## 16. $V_{CMRBL}$

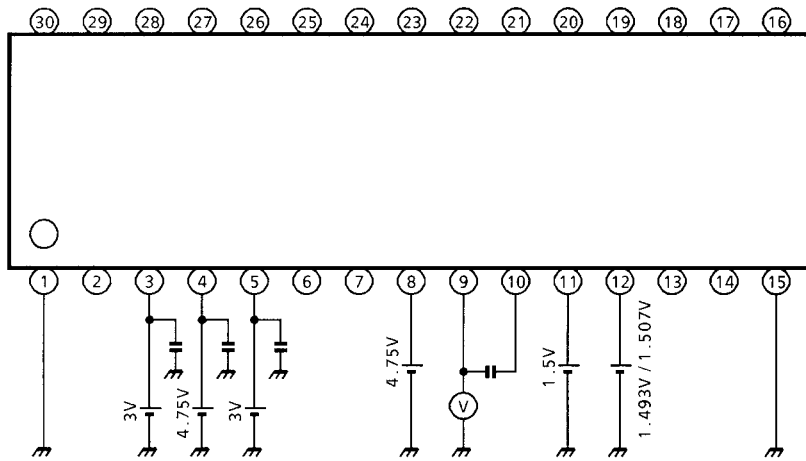


- $V_{CMRBL}$   
 Check BOUT2 pin : L when  $V_{RFB} = 3.05\text{ V}$ ,  $V_{RSB} = 0\text{ V}$ .  
 Check BOUT2 pin : L when  $V_{RFB} = 0\text{ V}$ ,  $V_{RSB} = 3.05\text{ V}$ .

## 17. $I_{BL}$



18. V<sub>OFBL</sub>



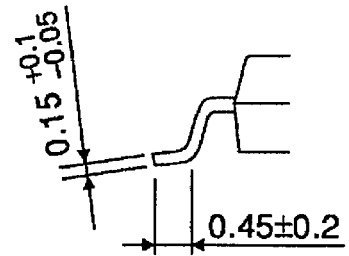
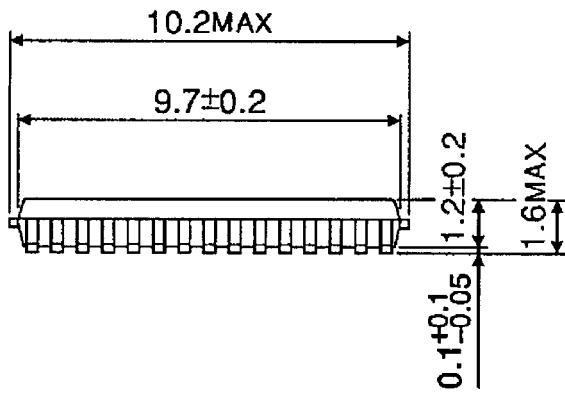
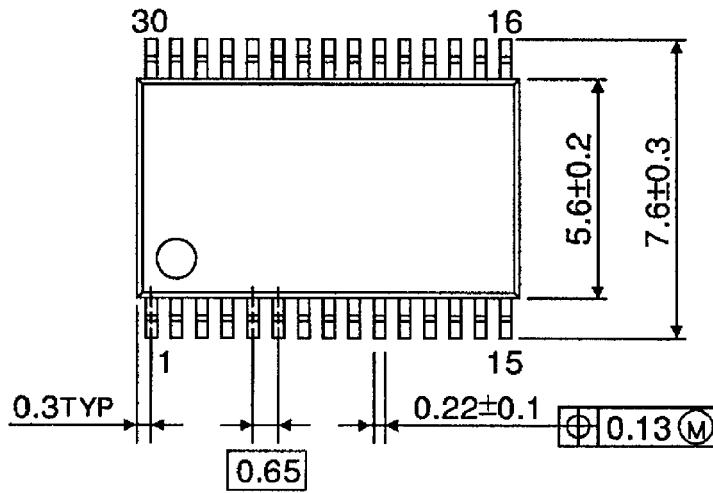
- V<sub>OFBL</sub>  
 Input V<sub>RSB</sub> = 1.5 V,  
 V<sub>RFB</sub> = 1.5 V ± 7 mV, and  
 check the switching of BOUT2  
 pin output function.  
 BOUT2: H when  
 V<sub>RFB</sub> = 1.493 V.  
 BOUT2: L when  
 V<sub>RFB</sub> = 1.507 V.



## PACKAGE DIMENSIONS

SSOP30-P-300-0.65

Unit: mm



Weight: 0.17 g (Typ.)

**RESTRICTIONS ON PRODUCT USE**

000707EBA

- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.  
In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.