

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

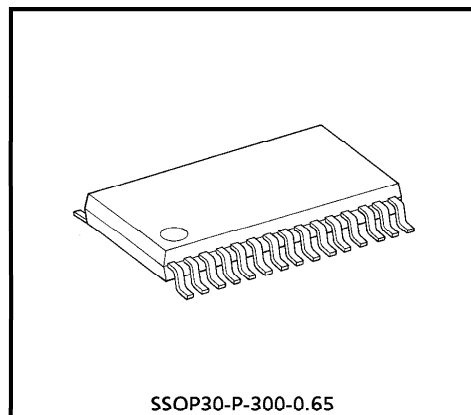
TA8482FN

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

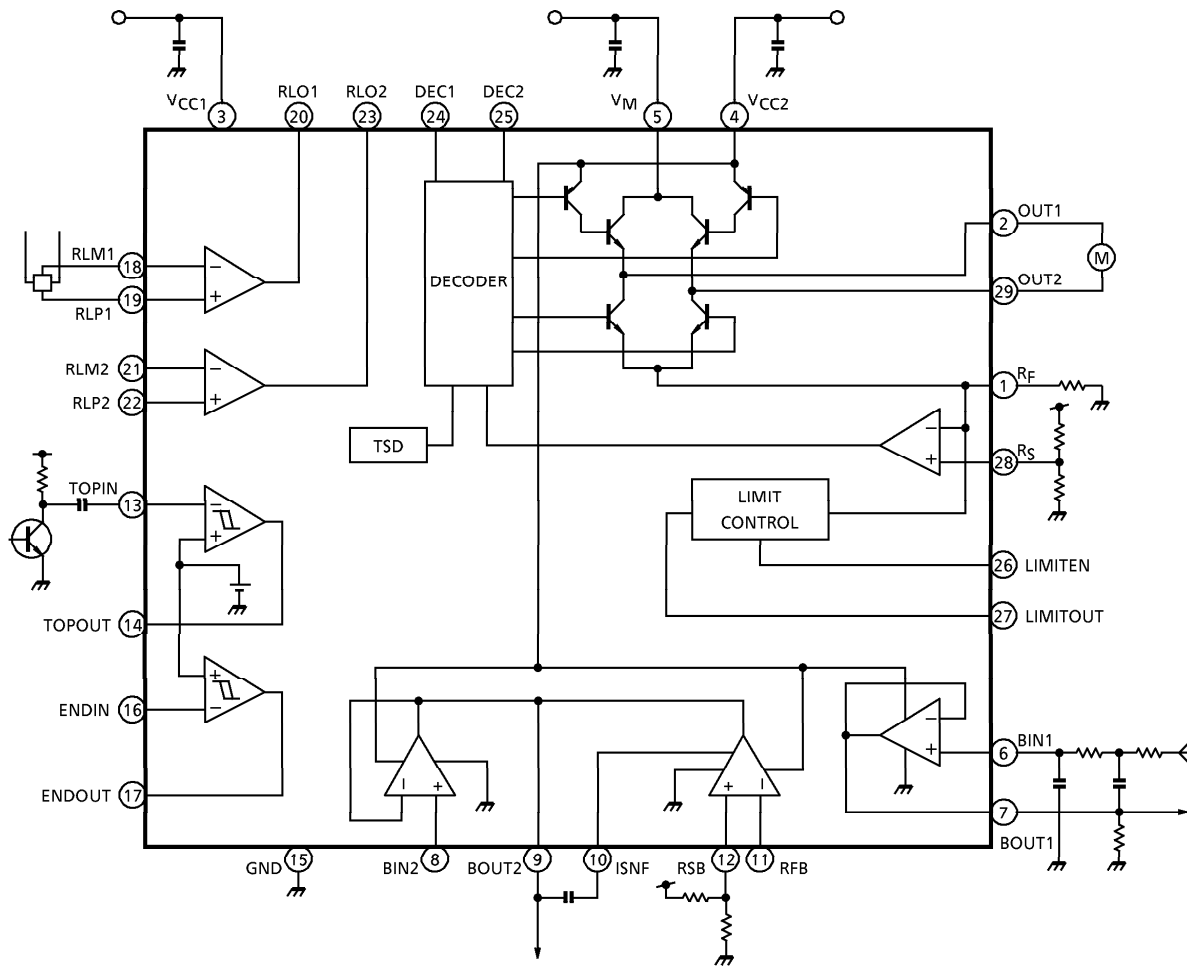


Weight : 0.17g (Typ.)

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BLOCK DIAGRAM



PIN FUNCTION

PIN No.	SYMBOL	PIN NAME
1	R _F	Output current detect pin
2	OUT1	Motor drive output pin 1
3	V _{CC1}	Power supply input pin 1
4	V _{CC2}	Power supply input pin 2
5	V _M	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 _S	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 _{CC1}	10	V
Output Section Supply Voltage	V _{CC2}	11	V
Output Section Supply Voltage	V _M	8	V
Output Current	I _O	0.6	A
Power Dissipation	P _D	0.86 (Note 1)	W
		1.13 (Note 2)	
Operating Temperature	T _{opr}	-20~80	°C
Storage Temperature	T _{stg}	-55~150	°C

(Note 1) Single body

(Note 2) Substrate mounting (50×50×1.6mm 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 _{CC1}	2.7~4.0	V
Output Section Supply Voltage	V _{CC2}	V _{CC1} ~9.0	V
Output Section Supply Voltage	V _M	1.0~7.0 (Note 3)	V

(Note 3) V_{CC2} ≥ V_M

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

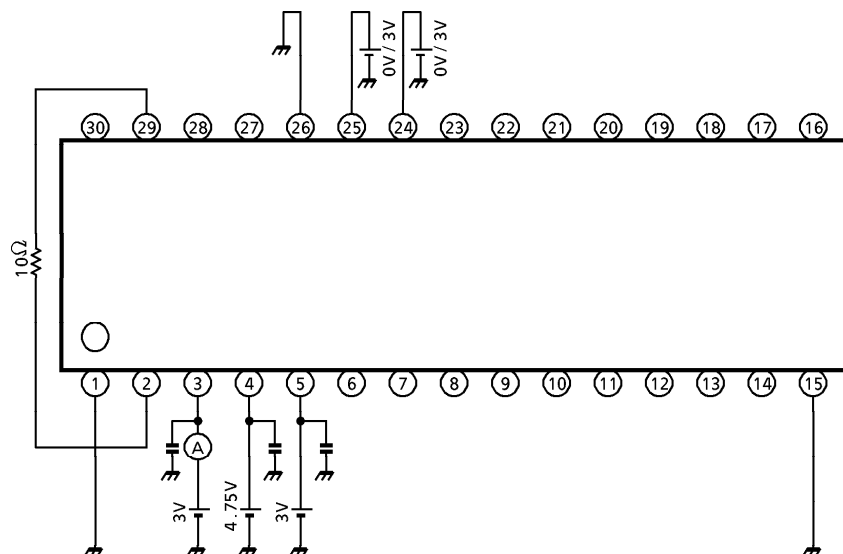
ELECTRICAL CHARACTERISTICS ($V_{CC1} = 3.0V$, $V_{CC2} = 4.75V$, $V_M = 3.0V$, $T_a = 25^\circ C$)

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	$R_L = 10\Omega$, $V_{CC1} = 0V$ DEC1 : L, DEC2 : L	—	—	1	μA
			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	μA
Decoder Circuit	Input Voltage	"H" level	V_{IN1}	4	$R_L = 10\Omega$	2.0	—	—	V
		"L" level	V_{IN2}		$R_L = 10\Omega$	—	—	0.6	
	Input Current		I_{IN}		$V_{IN} = 3.0V$	—	—	3	μA
	Input Leakage Current		I_{INL}		$V_{IN} = 0V$	—	—	1	
Output Circuit	Saturation Voltage (Upper Side + Lower side)		$V_{sat} (H + L)$	5	$I_O = 0.2A$	—	0.3	0.45	V
					$I_O = 0.4A$	—	0.6	0.75	
Current Limiter Amp	Reference Voltage Input Range		V_{RS}	6		0.05	—	1.0	V
	Detecting Voltage		V_{LIMIT}	7	$R_L = 10\Omega$, $R_F = 1\Omega$ $V_{RS} = 0.2V$	0.18	0.2	0.22	
Current Limiter Controller	Input Voltage	"H" level	$V_{LE} (H)$	8	$R_L = 10\Omega$	2.0	—	—	V
		"L" level	$V_{LE} (L)$		$R_L = 10\Omega$	—	—	0.6	
	Input Current		I_{LC}		$V_{LE} = 3.0V$	—	—	3	μA
	Input Leakage Current		I_{LCL}		$V_{LE} = 0V$	—	—	1	
	Output Voltage	"H" level	$V_{LO} (H)$		$I_O = 10\mu A$	$V_{CC1} - 0.5$	—	—	V
		"L" level	$V_{LO} (L)$		$I_O = 10\mu A$	—	—	0.4	

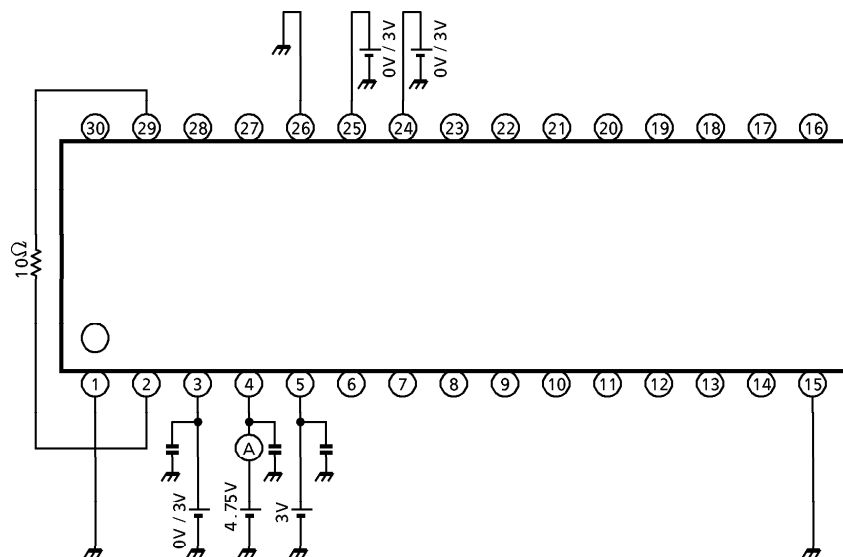
CHARACTERISTIC		SYMBOL	TEST CIR- CUIT	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Reel FG Amp	Common-Phase Voltage Range	V _{CMRFG}	9		1.0	—	2.0	V
	Input Current	I _{FG}	10	V _{CMRFG} = 1.5V	—	—	1	μA
	Output Offset Voltage	V _{OFFG}			—	0	± 290	mV
	Closed Loop Voltage Gain	G _{VFG}	11	f _{FG} = 1kHz	27	29	31	dB
	Open Loop Voltage Gain	G _{VOFG}	—	f _{FG} = 1kHz Design assurance	—	55	—	dB
	Output Residual Voltage	V _{sat} -FG (H)	12	I _O = 10μA (Upper side)	—	—	0.2	V
V _{sat} -FG (L)		I _O = 10μA (Lower side)		—	—	0.2		
Top / End Sensor Amp	Input Resistance	R _{IN}	13		4	5	6	kΩ
	Minimum Input Sensitivity	V _{HS}	—	Design assurance	30	40	50	mV _{p-p}
Buffer Amp	Input Voltage Range	V _{CMRBL}	14		0	—	V _{CC2}	V
	Input Current	I _B		V _{BIN} = 0V, (Note)	—	—	1	μA
	Input Offset Voltage	V _{OFB}		V _{BIN} = 1.5V	—	0	± 7	mV
	Output Voltage (Upper Side)	V _{OB} (H)		R _L = 20kΩ (against GND)	V _{CC2} – 1.7	—	—	V
	Output Voltage (Lower Side)	V _{OB} (L)	15	V _{BOUT} = 0V, R _L = 500kΩ (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} = 0V	—	—	1	μA
	Input Offset Voltage	V _{OFBL}	18	V _{RSB} = 1.5V	—	0	± 7	mV
Thermal Shutdown Circuit Operating Temperature		T _{SD}	—	Design assurance	—	150	—	°C

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

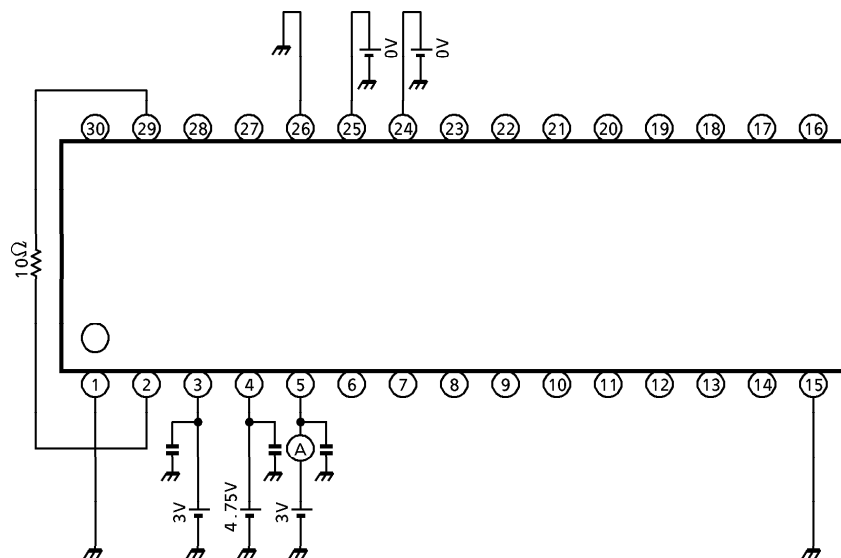
TEST CIRCUIT

1. I_{CC1} , I_{CC2} , I_{CC3} 

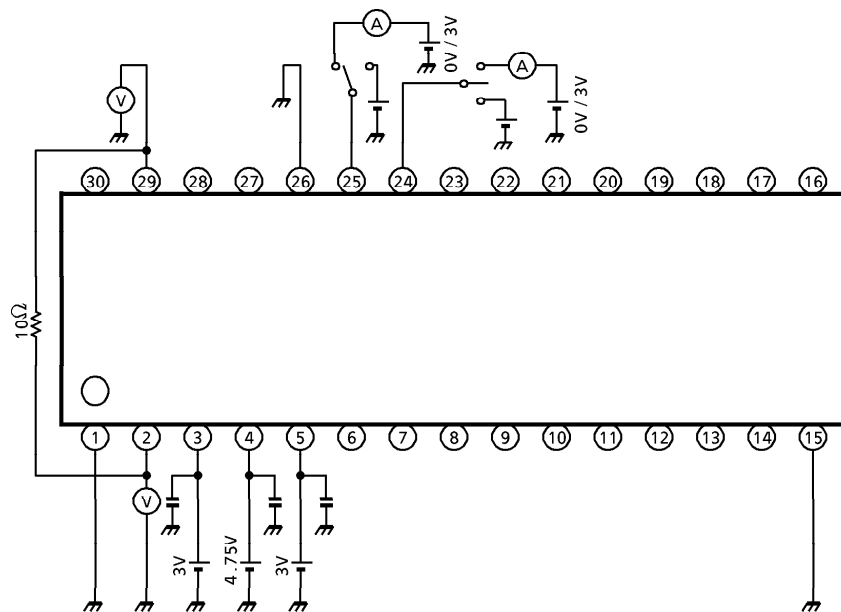
- I_{CC11}
DEC1 = L, DEC2 = L
- I_{CC12}
DEC1 = H, DEC2 = L
and
DEC1 = L, DEC2 = H
- I_{CC13}
DEC1 = H, DEC2 = H

2. I_{CC21} , I_{CC22} , I_{CC23} , I_{CC24} 

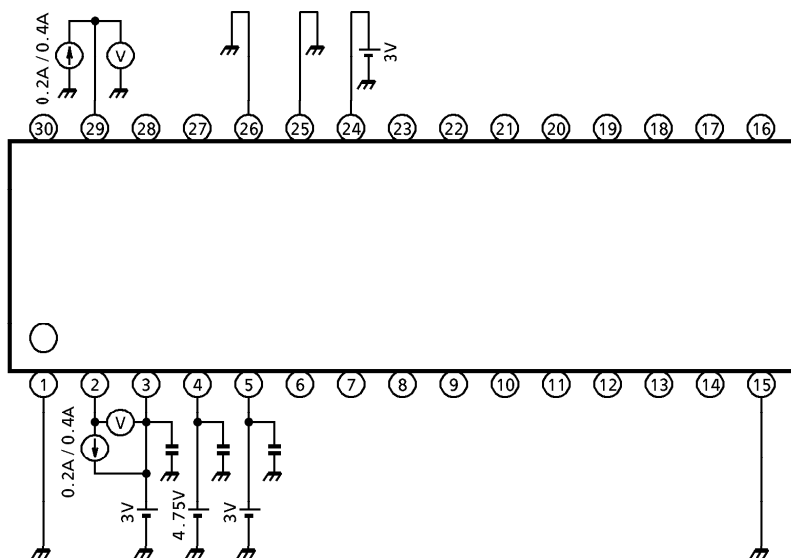
- I_{CC21}
 $V_{CC1} = 0V$, DEC1 = L, DEC2 = L
- I_{CC22}
 $V_{CC1} = 3V$, DEC1 = L, DEC2 = L
- I_{CC23}
DEC1 = H, DEC2 = L
and
DEC1 = L, DEC2 = H
- I_{CC24}
DEC1 = H, DEC2 = H

3. I_M 

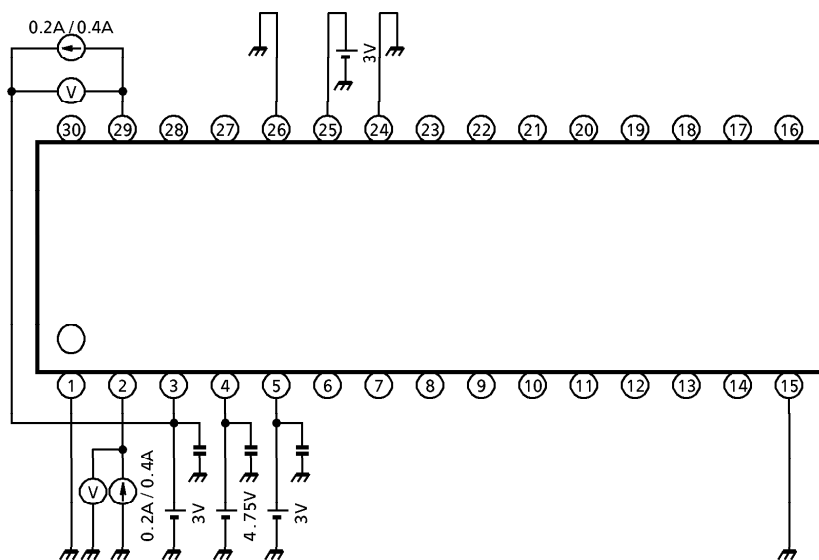
- I_M
DEC1 = L, DEC2 = L

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

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

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

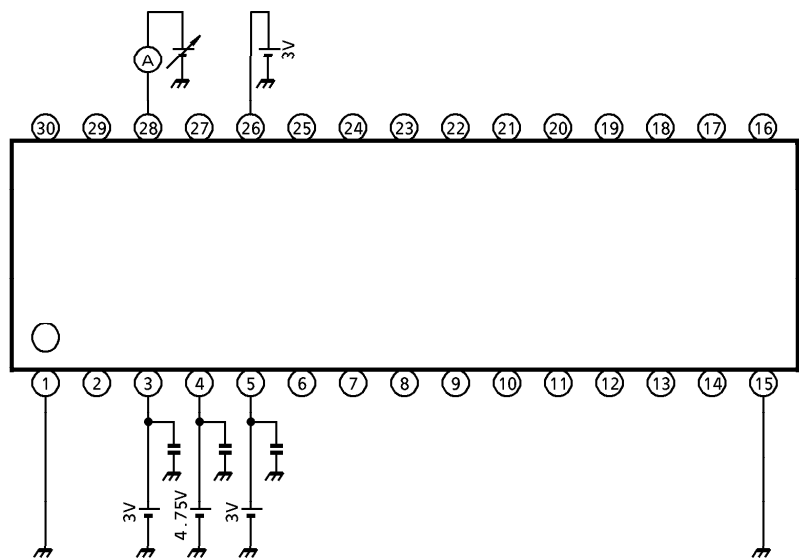
- $V_{\text{sat}} (H + L)$
Input DEC1 = H, DEC2 = L, and measure OUT1 (upper side) and OUT2 (lower side) with regard to $I_O = 0.2A / 0.4A$.



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

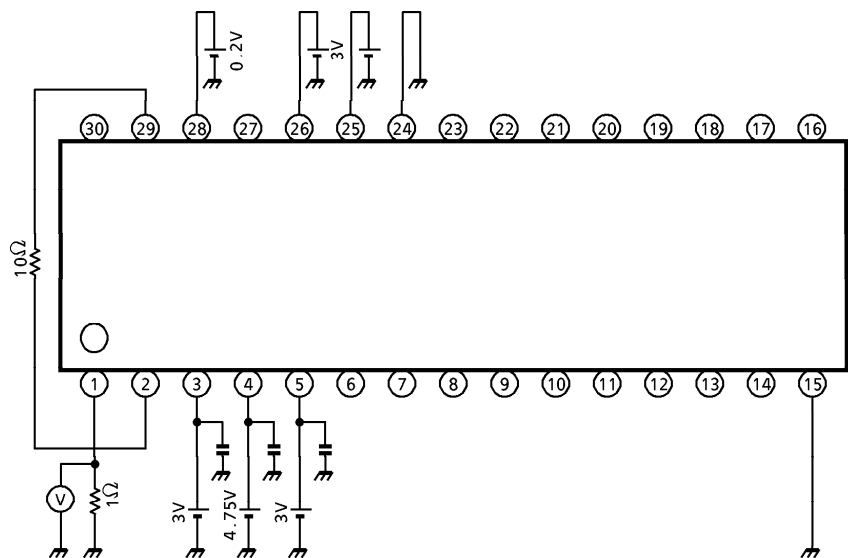
The sum of the upper/lower values of OUT1 and OUT2 is fixed at $V_{\text{sat}} (H + L)$.

6. V_{RS}

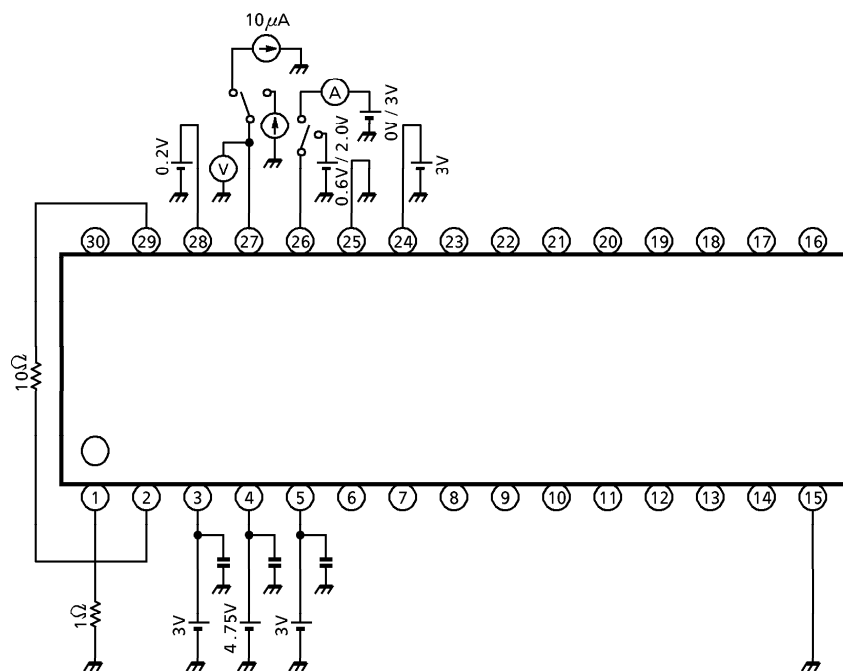


- V_{RS}
Change V_{RS} and measure input current.

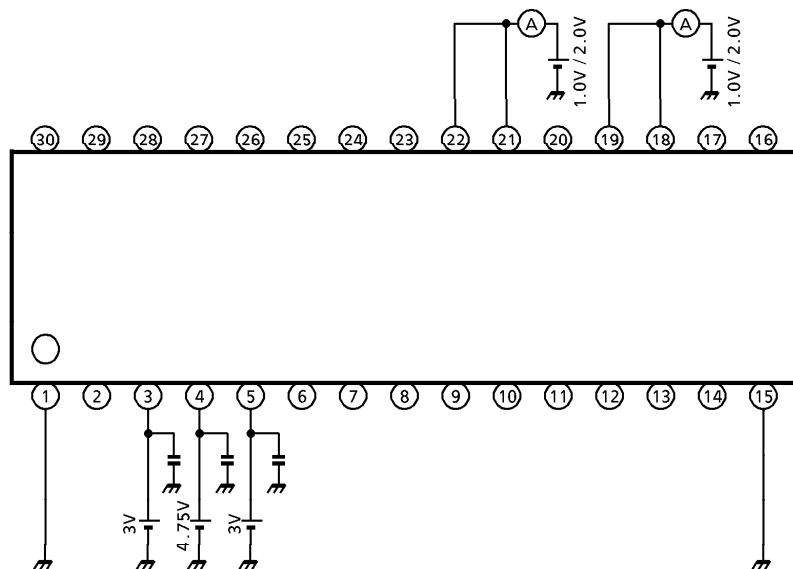
7. V_{LIMIT}

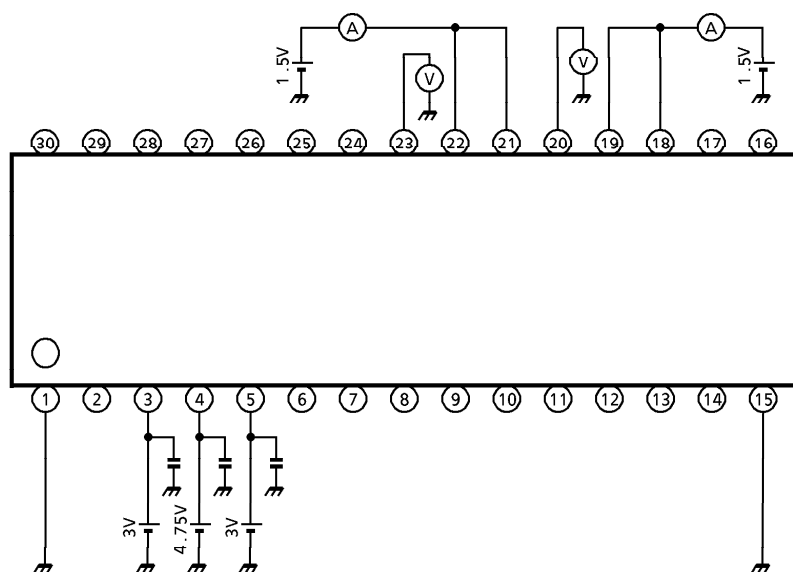


- V_{LIMIT}
Input $V_{RS} = 0.2V$ and measure $R_F (= 1\Omega)$ generating voltage at the time of limiter amp operation.

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

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

9. V_{CMRFG} 

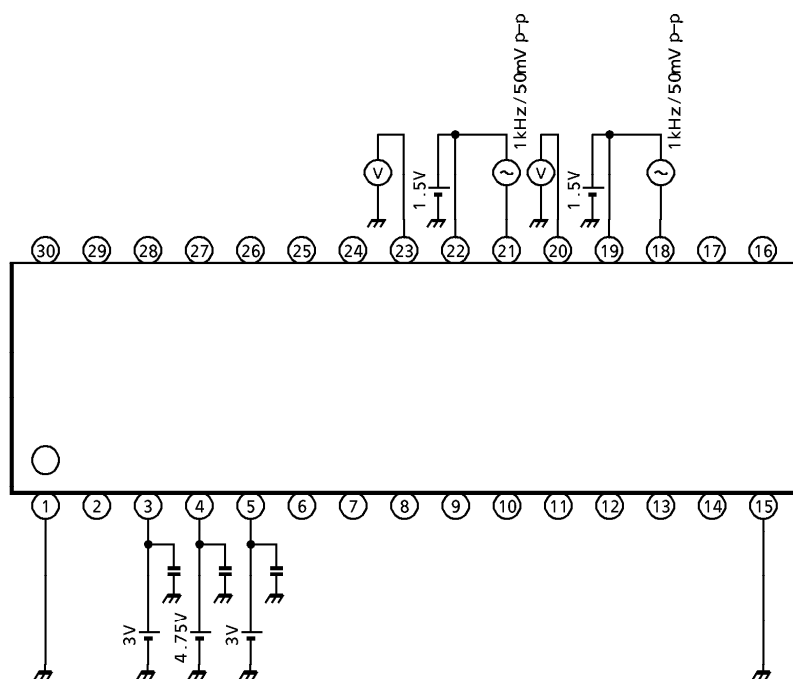
10. I_{FG} , V_{OFFG} 

- I_{FG}
Measure the input current (I_{FG}') when $V_{CMRFG} = 1.5V$, and calculate the following formula :

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

- V_{OFFG}
Measure the R_{LO} pin output voltage when $V_{CMRFG} = 1.5V$, and calculate the following formula :

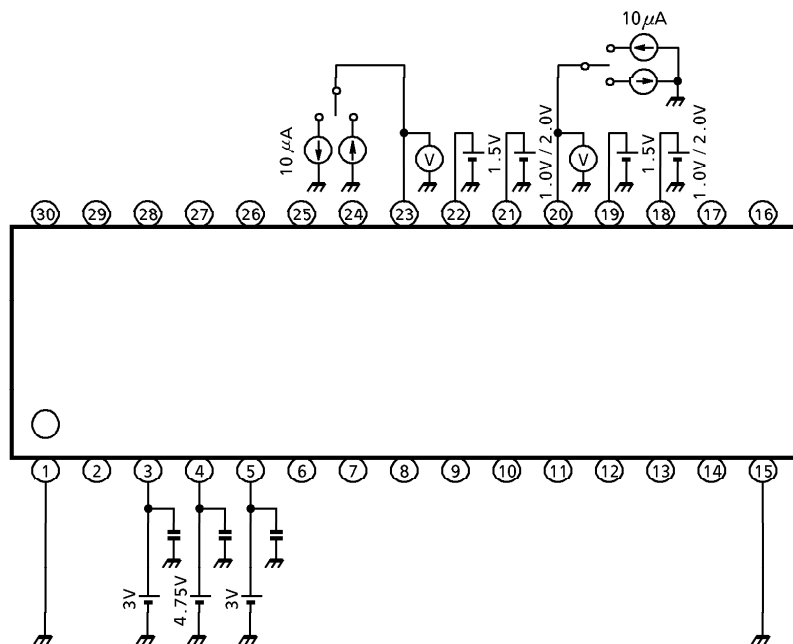
$$V_{OFFG} = V_{RLO} - 1.5$$

11. G_{VFG} 

- G_{VFG}
 $V_{RLP} = 1.5V$, input signals

$f_{FG} = 1kHz$, $V_{FG} = 50mV_{p-p}$ between RLP and RLM, and measure V_{RLO} in this case.

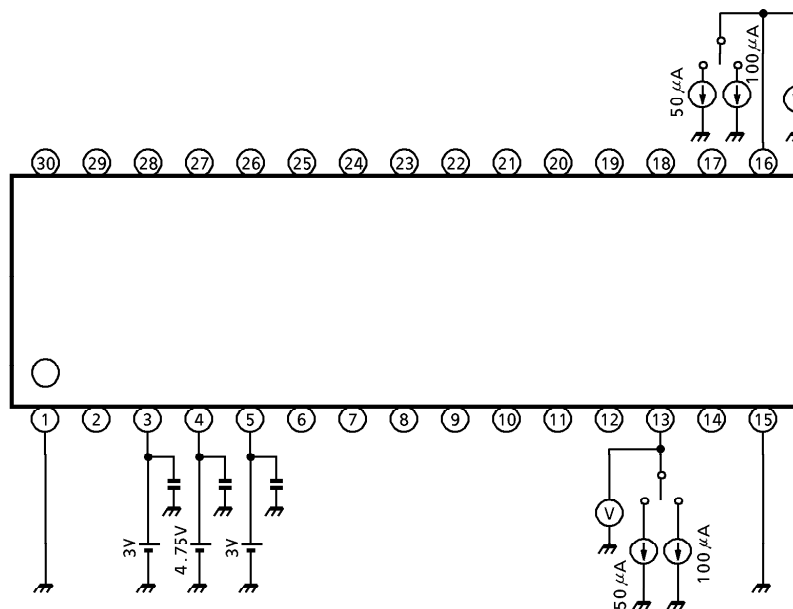
$$G_{VFG} = 20 \log \frac{V_{RLO}}{0.05} \text{ [dB]}$$

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

- $V_{\text{sat-FG}}(\text{H})$
Input $V_{\text{RLP}} = 1.5\text{V}$,
 $V_{\text{RLM}} = 1.0\text{V}$, measure the
 R_{LO} pin voltage when
 $I_{\text{O}} = 10\mu\text{A}$ (source current),
and calculate the following
formula :

$$V_{\text{sat-FG}}(\text{H}) = 3.0 - V_{\text{RLO}} [\text{V}]$$

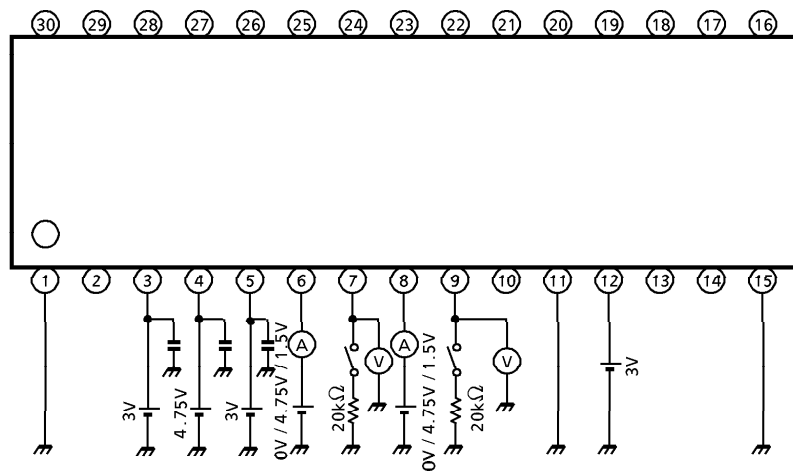
- $V_{\text{sat-FG}}(\text{L})$
Input $V_{\text{RLP}} = 1.5\text{V}$,
 $V_{\text{RLM}} = 2.0\text{V}$ and measure the
 R_{LO} pin voltage when
 $I_{\text{O}} = 10\mu\text{A}$ (sink current).

13. R_{IN} 

- R_{IN}
Measure the V_{TOPIN} , V_{ENDIN}
at the time $50\mu\text{A} / 100\mu\text{A}$
current flows from TOPIN /
ENDIN pin, and calculate the
following formula :
$$R_{\text{IN}} = \frac{V(50\mu\text{A}) - V(100\mu\text{A}) - 0.007}{50\mu\text{A}} [\Omega]$$

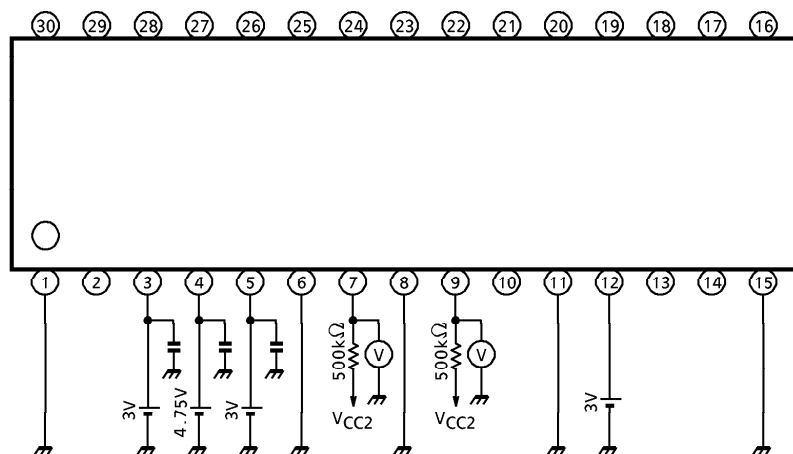
* The 7mV in the formula
represents the V_{BE} change of
the internal Tr. at the time
of $50\mu\text{A} / 100\mu\text{A}$.

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

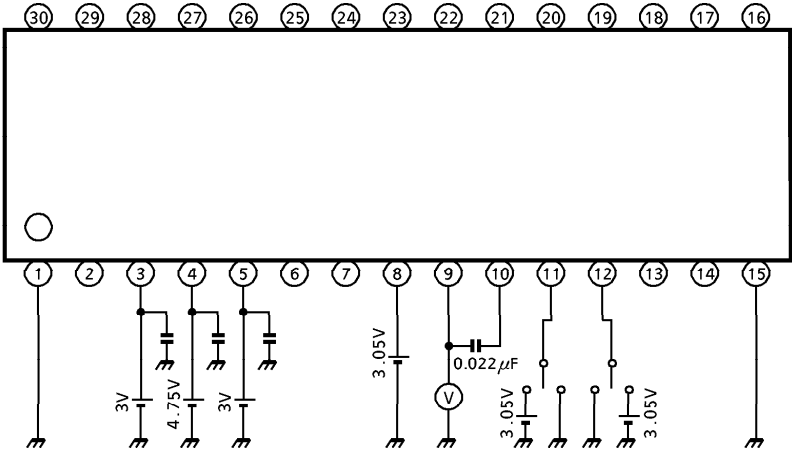


- V_{CMRB}
Input $V_{BIN} = 0V / 4.75V$ and measure BOUT pin voltage.
- I_B
 $V_{BIN} = 1.5V$
- $V_{OB} (H)$
Input $V_{BIN} = 4.75V$ and connect $20k\Omega$ (against GND) to BOUT pin.

15. $V_{OB} (L)$

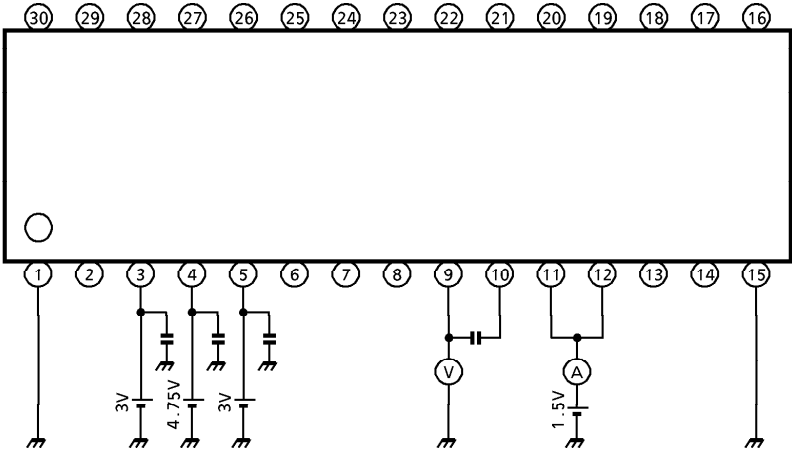


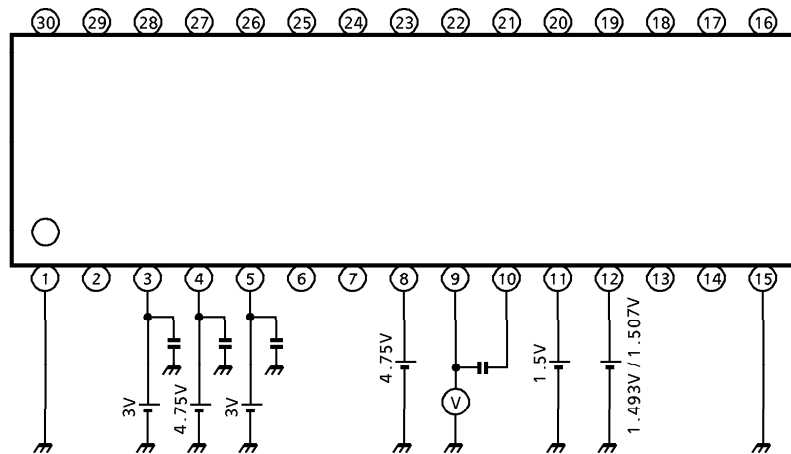
16. V_{CMRBL}



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

17. I_{BL}

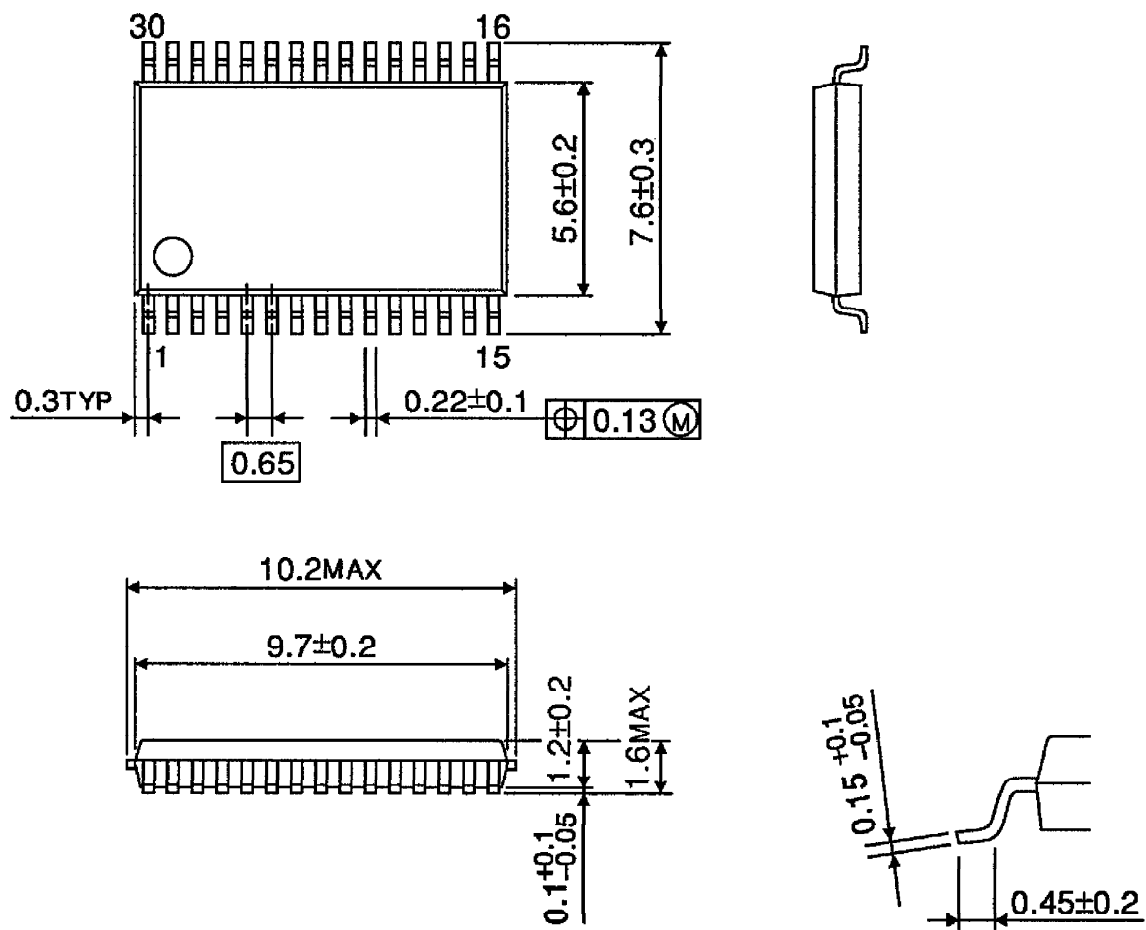


18. V_{OFBL} 

- V_{OFBL}
 Input $V_{RSB} = 1.5V$,
 $V_{RFB} = 1.5V \pm 7mV$, and check
 the switching of BOUT2 pin
 output function.
 BOUT2 : H when
 $V_{RFB} = 1.493V$.
 BOUT2 : L when
 $V_{RFB} = 1.507V$.

OUTLINE DRAWING
SSOP30-P-300-0.65

Unit : mm



Weight : 0.17g (Typ.)