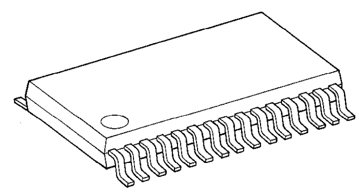
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

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.



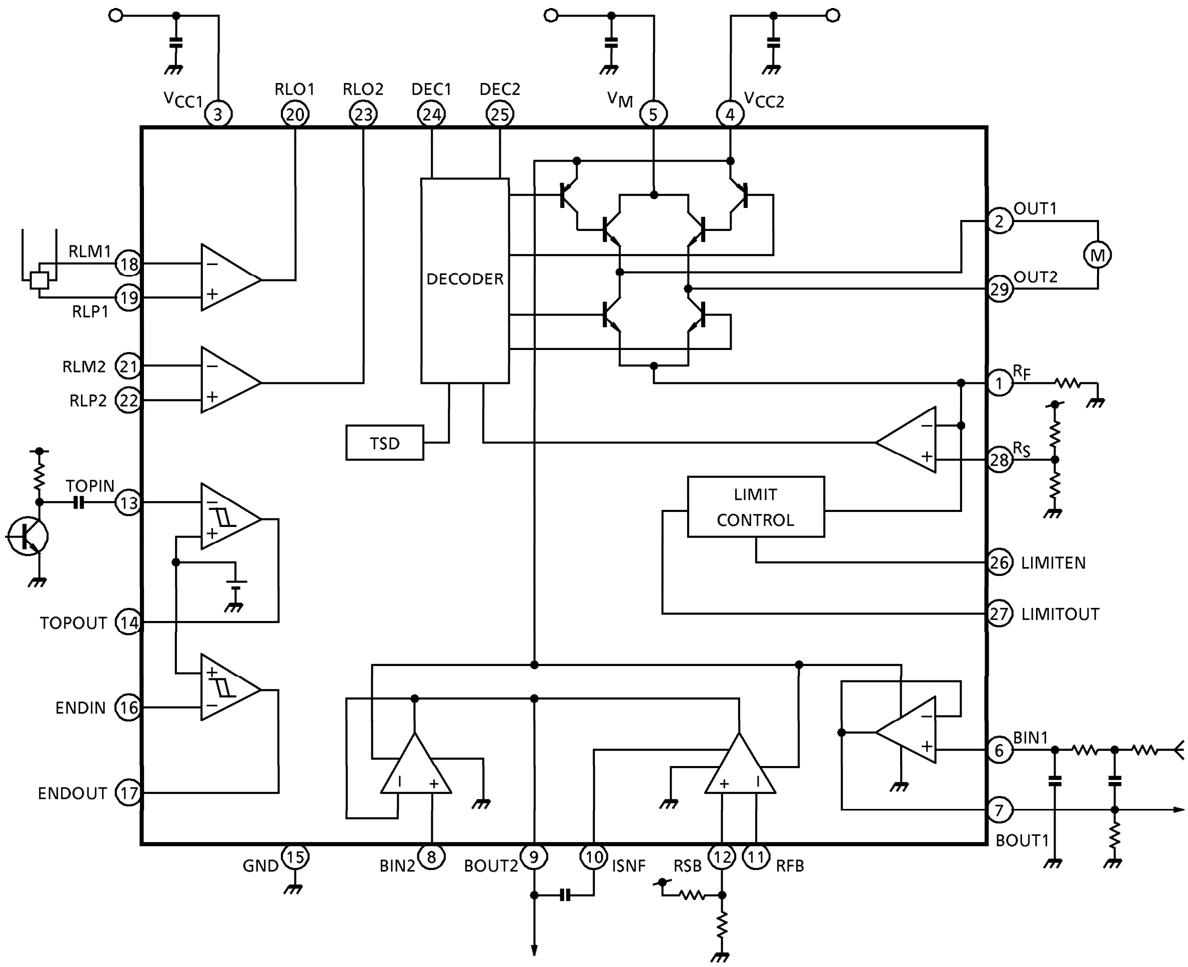
SSOP30-P-300-0.65

Weight : 0.17g (Typ.)

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

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) $V_{CC2} \geqq V_M$
(*) The range of operating conditions covers normal operations under the condition specified for electrical characteristics.

ELECTRICAL CHARACTERISTICS ($V_{CC1}=3.0V$, $V_{CC2}=4.75V$, $V_M=3.0V$, Ta = 25°C)

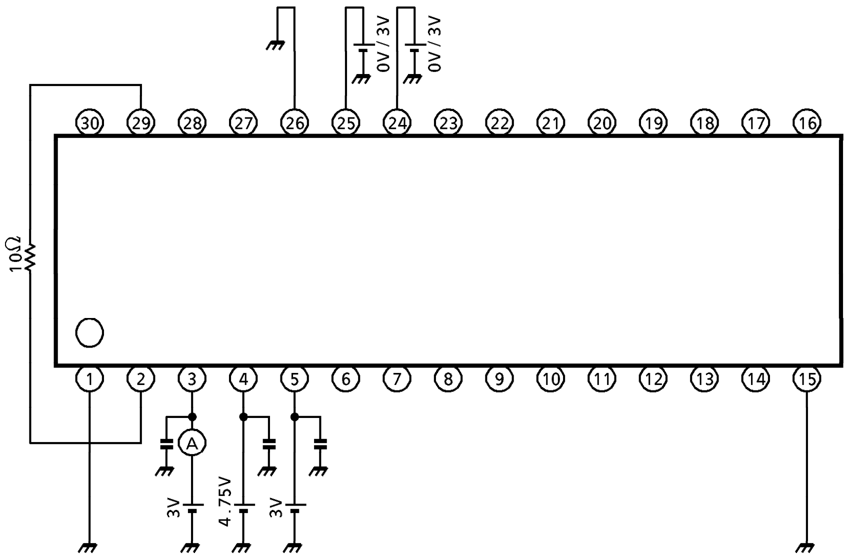
CHARACTERISTIC			SYMBOL	TEST CIR-CUIT	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply Current			I_{CC11}	1	$R_L=10\Omega$ DEC1 : L, DEC2 : L	—	3	4.2	mA
			I_{CC12}		$R_L=10\Omega$ DEC1 : H / L, DEC2 : L / H	—	20	30	
			I_{CC13}		$R_L=10\Omega$ DEC1 : H, DEC2 : H	—	42	60	
			I_{CC21}	2	$R_L=10\Omega$, $V_{CC1}=0V$ 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	$V_{sat\text{-}FG\ (H)}$	12	$I_O = 10\mu A$ (Upper side)	—	—	0.2	V
		$V_{sat\text{-}FG\ (L)}$		$I_O = 10\mu A$ (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	$mV_{p\text{-}p}$
Buffer Amp	Input Voltage Range	V_{CMRB}	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)	$V_{OB\ (H)}$		$R_L = 20k\Omega$ (against GND)	$V_{CC2} - 1.7$	—	—	V
	Output Voltage (Lower Side)	$V_{OB\ (L)}$	15	$V_{BOUT} = 0V$, $R_L = 500k\Omega$ (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	$V_{BL} = 0V$	—	—	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 0.5μA (Max.)

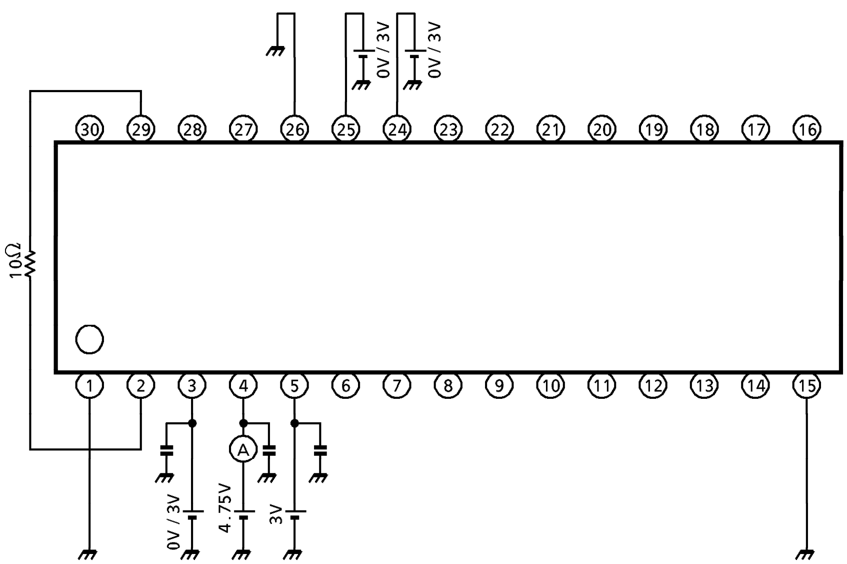
TEST CIRCUIT

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



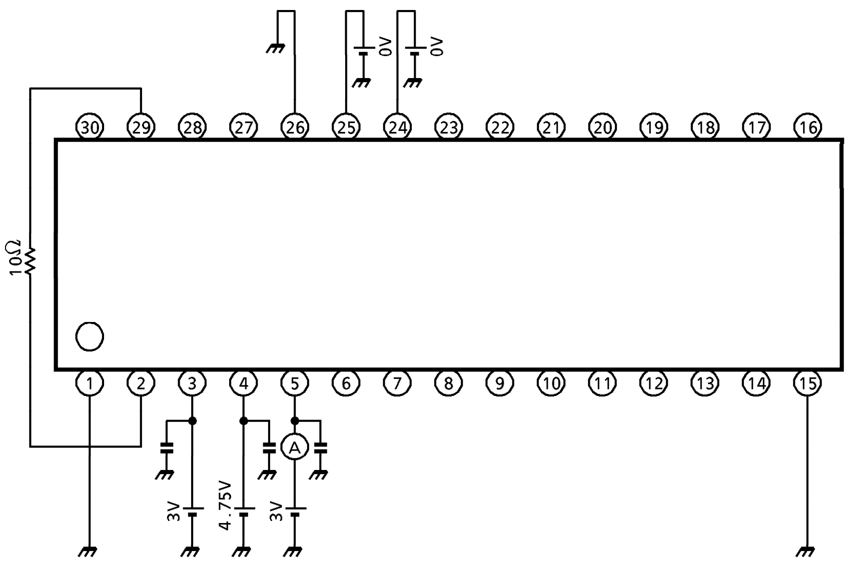
- I_{CC11}
  DEC1 = L, DEC2 = L
- I_{CC12}
  DEC1 = H, DEC2 = L
  and
  DEC1 = L, DEC2 = H
- I_{CC13}
  DEC1 = H, DEC2 = H

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



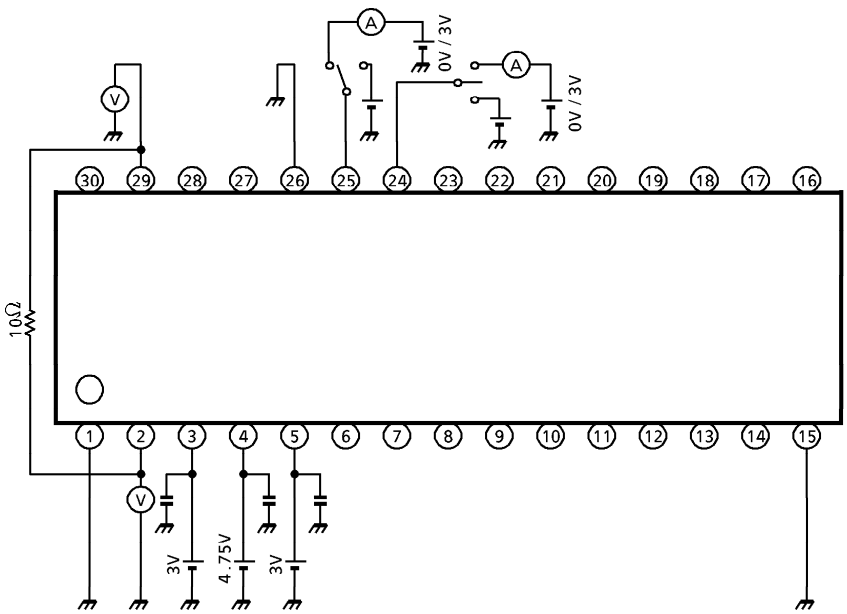
- I_{CC21}
  V_{CC1} = 0V, DEC1 = L, DEC2 = L
- I_{CC22}
  V_{CC1} = 3V, DEC1 = L, DEC2 = L
- I_{CC23}
  DEC1 = H, DEC2 = L
  and
  DEC1 = L, DEC2 = H
- I_{CC24}
  DEC1 = H, DEC2 = H

3. I_M



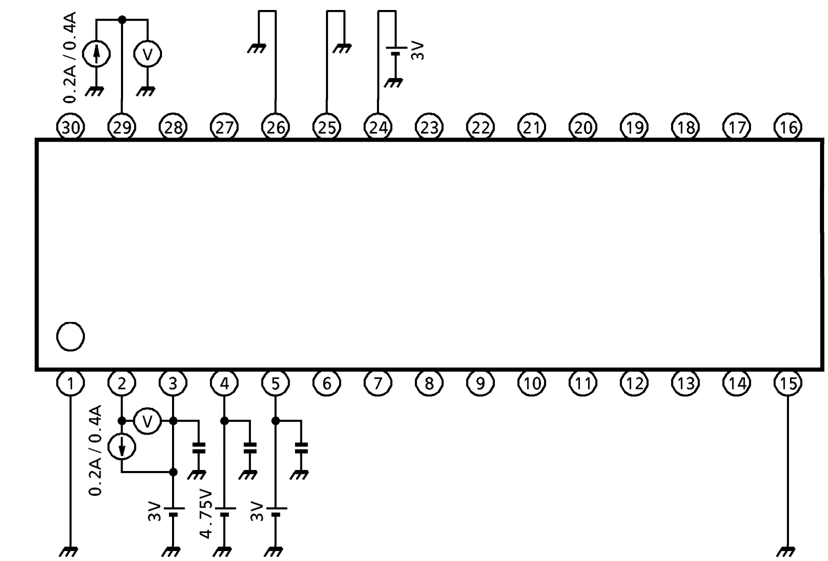
- I_M
  DEC1 = L, DEC2 = L

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

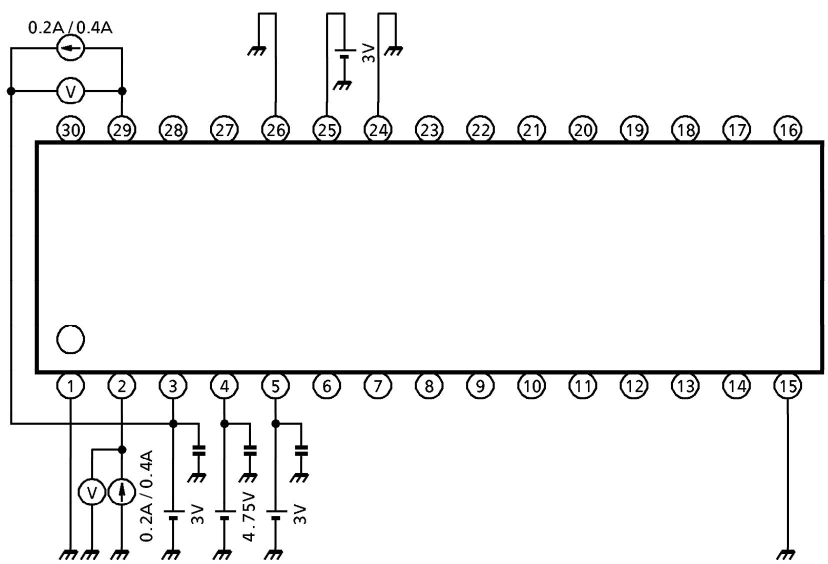


- V_{IN1}, V_{IN2}
  $V_{DEC1} = 0.6V$, $V_{DEC2} = 2.0V$
  $V_{DEC1} = 2.0V$, $V_{DEC2} = 0.6V$
  $V_{DEC1} = 2.0V$, $V_{DEC2} = 2.0V$
  Check the output functions on the above-mentioned three conditions.
- I_{IN1}
  $V_{IN} = 3.0V$
- I_{INL}
  $V_{IN} = 0V$

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



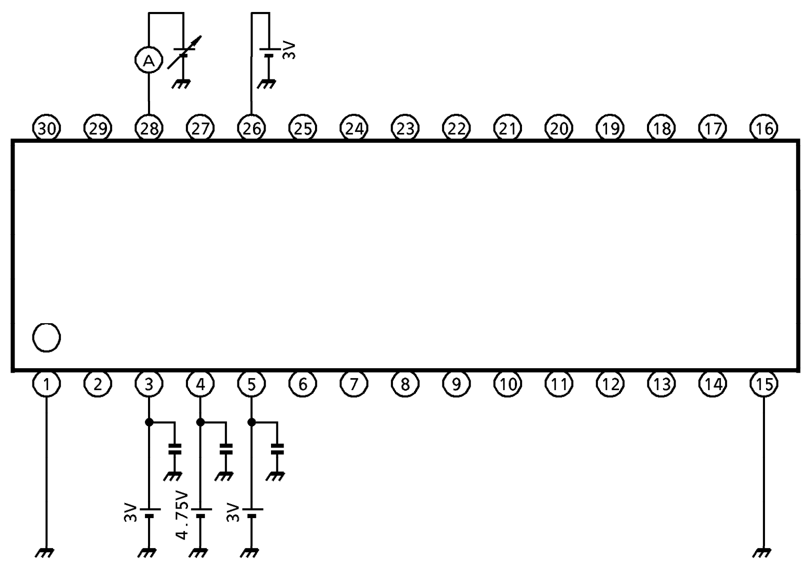
- $V_{sat\,(H + L)}$
  Input DEC1 = H, DEC2 = L, and measure OUT1 (upper side) and OUT2 (lower side) with regard to I_O = 0.2A / 0.4A.



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

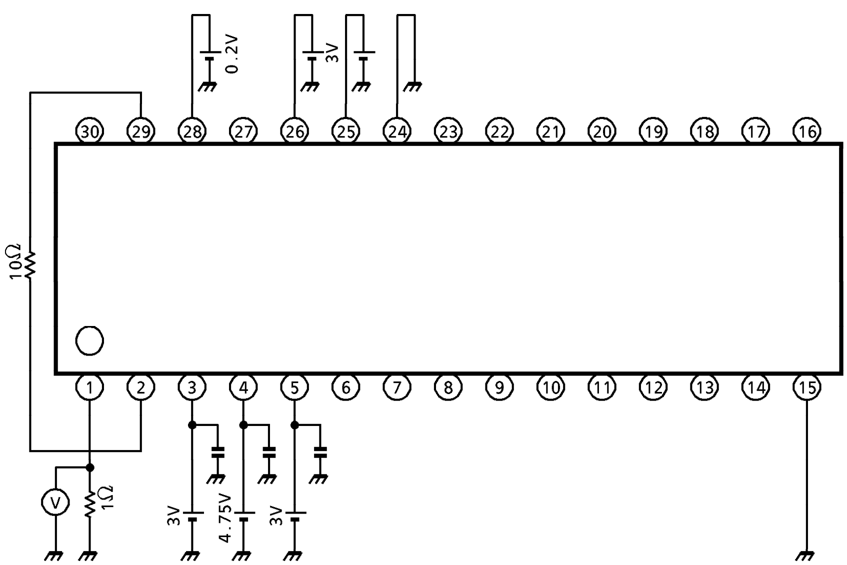
  The sum of the upper / lower values of OUT1 and OUT2 is fixed at $V_{sat\,(H + L)}$.

6. V_{RS}



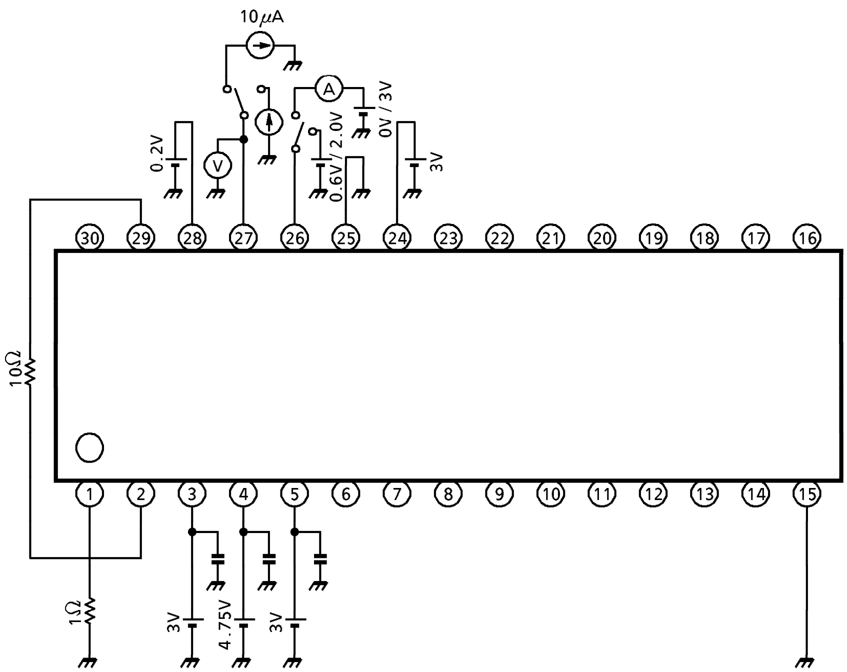
- V_{RS}
  Change V_{RS} and measure input current.

7. V_{LIMIT}



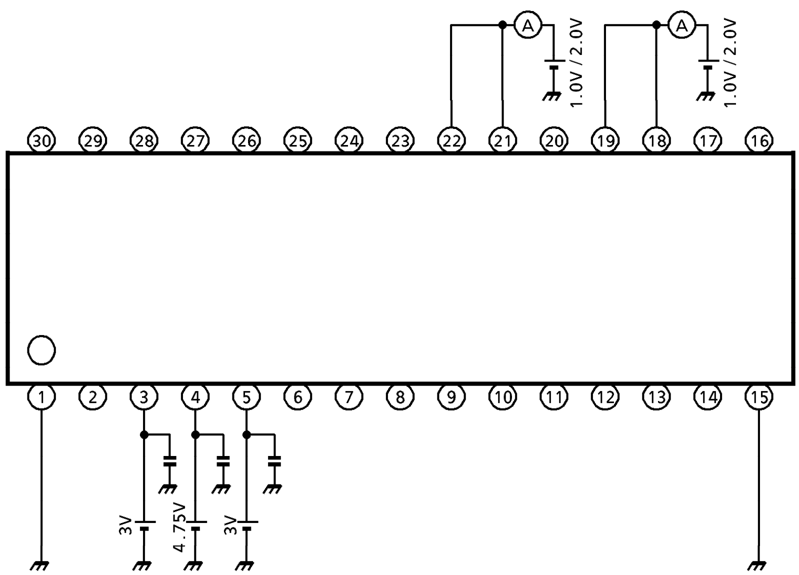
- V_{LIMIT}
  Input $V_{RS} = 0.2V$ and measure R_F ($= 1\Omega$) generating voltage at the time of limiter amp operation.

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

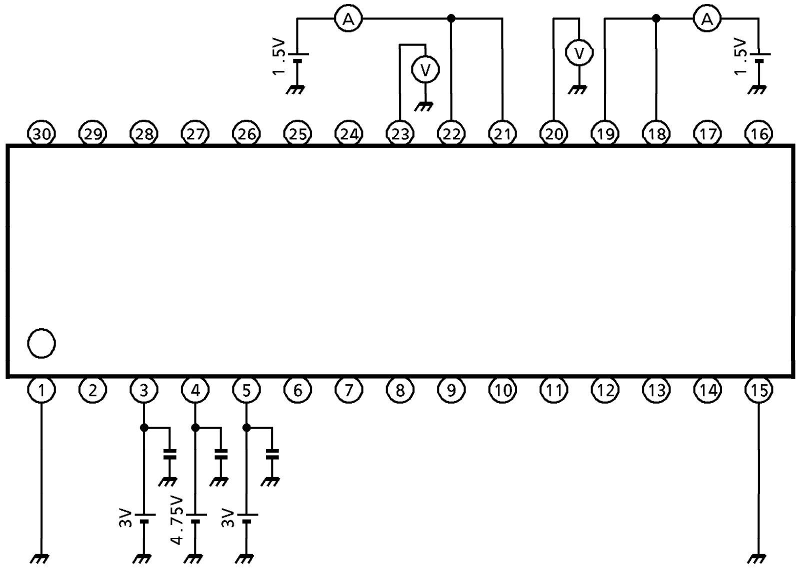


- $V_{LE\ (H)}$, $V_{LE\ (L)}$
  Input V_{LE} = 2.0V / 0.6V in a limiter amp operating state and check the LIMIT OUT terminal voltage.
- I_{LC}
  V_{LE} = 3.0V
- I_{LCL}
  V_{LE} = 0V
- $V_{LO\ (H)}$, $V_{LO\ (L)}$
  Input V_{LE} = 0.6V / 2.0V in a limiter amp operating state and measure the LIMIT OUT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

9. V_{CMRFG}



10. I_{FG}, V_{OFFG}



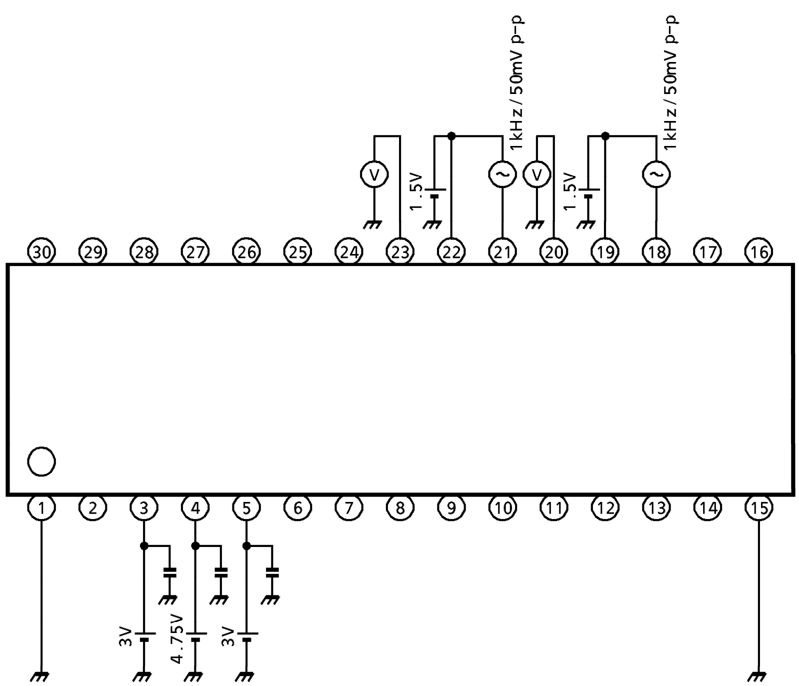
- I_{FG}
  Measure the input current (I_{FG}') when $V_{CMRFG} = 1.5V$, and calculate the following formula :

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

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

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

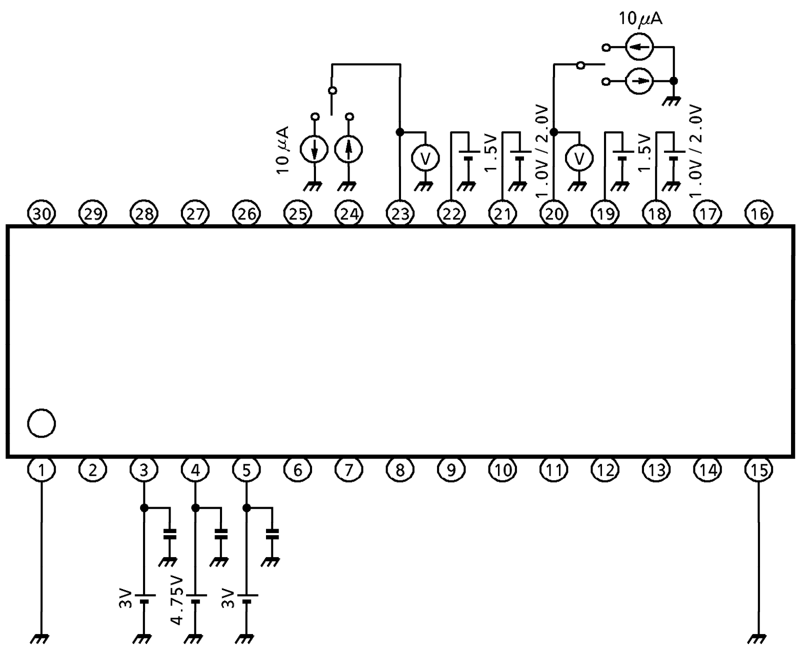
11. G_{VFG}



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

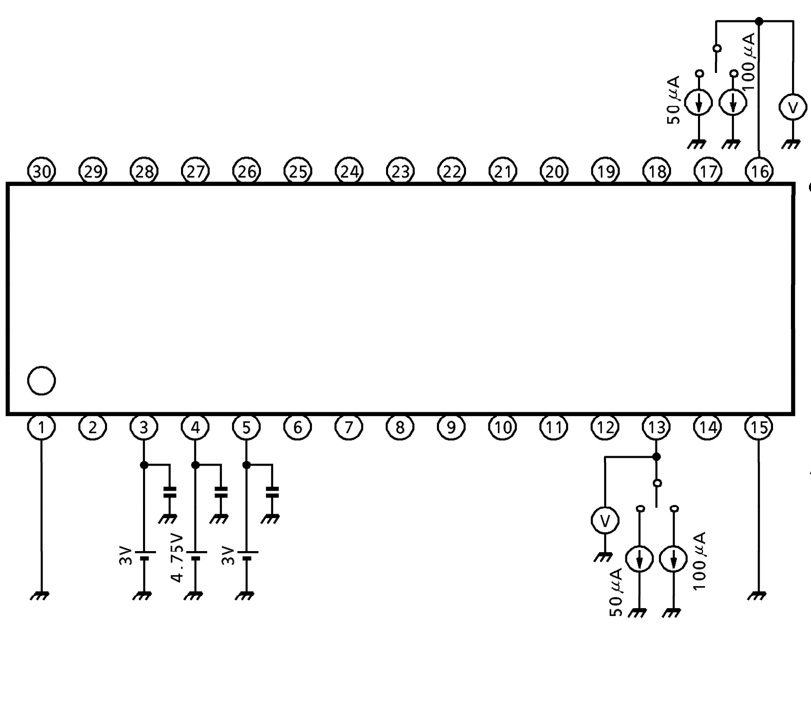
  $f_{FG} = 1kHz$, $V_{FG} = 50mV_{p\text{-}p}$
  between RLP and RLM, and measure V_{RLO} in this case.
  $G_{VFG} = 20\ell og\ \frac{V_{RLO}}{0.05}$ [dB]

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



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

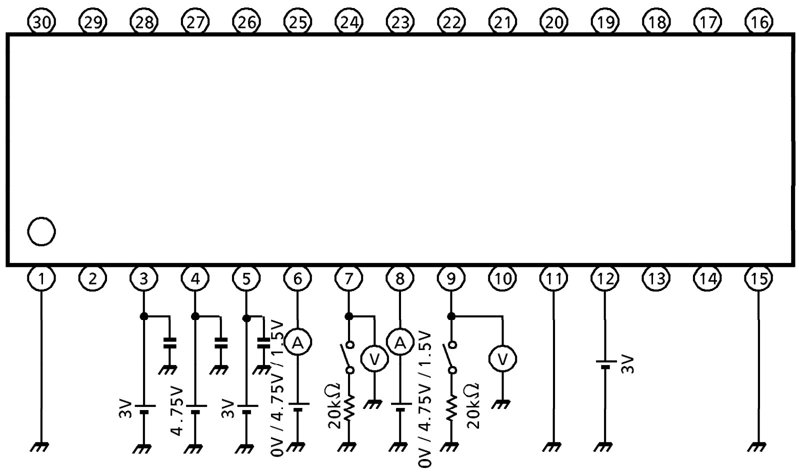
13. R_{IN}



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

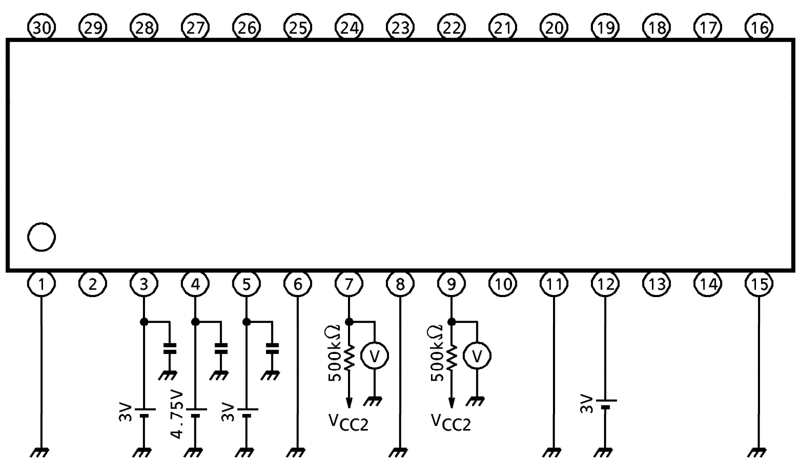
* The 7mV in the formula represents the V_{BE} change of the internal Tr. at the time of 50μA / 100μA.

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

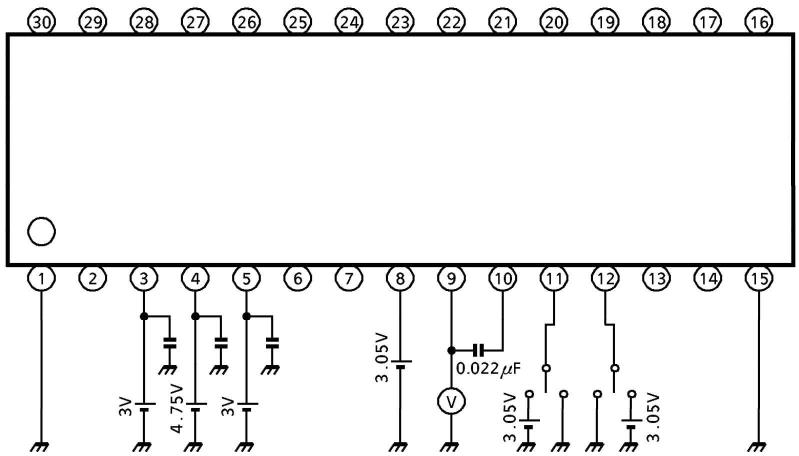


- V_{CMRB}
  Input V_{BIN} = 0V / 4.75V and measure BOUT pin voltage.
- I_B
  V_{BIN} = 1.5V
- V_{OB} (H)
  Input V_{BIN} = 4.75V and connect 20kΩ (against GND) to BOUT pin.

15. V_{OB} (L)

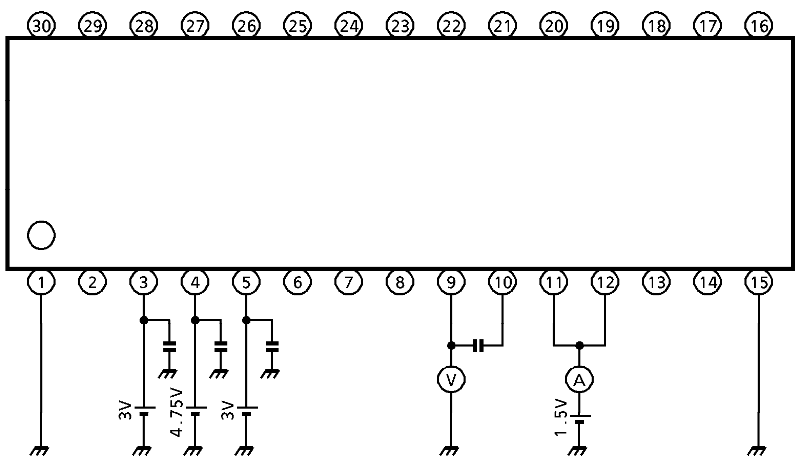


16. V_{CMRBL}

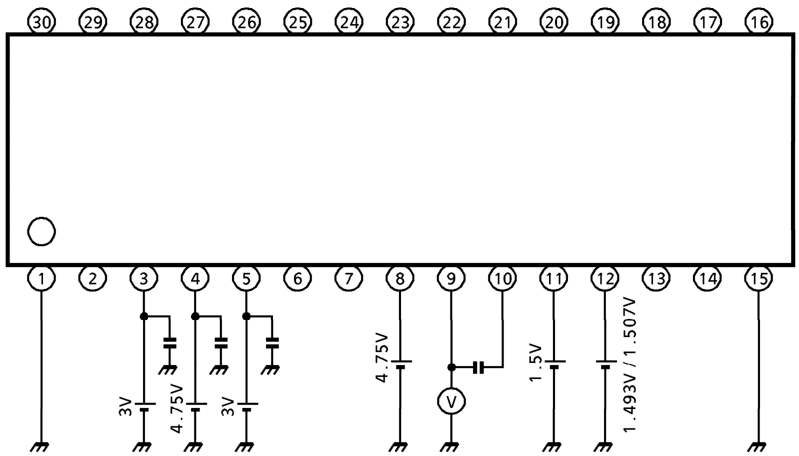


- V_{CMRBL}
  Check BOUT2 pin : L when $V_{RFB} = 3.05V$, $V_{RSB} = 0V$.
  Check BOUT2 pin : L when $V_{RFB} = 0V$, $V_{RSB} = 3.05$.

17. I_{BL}



18. V_{OFBL}

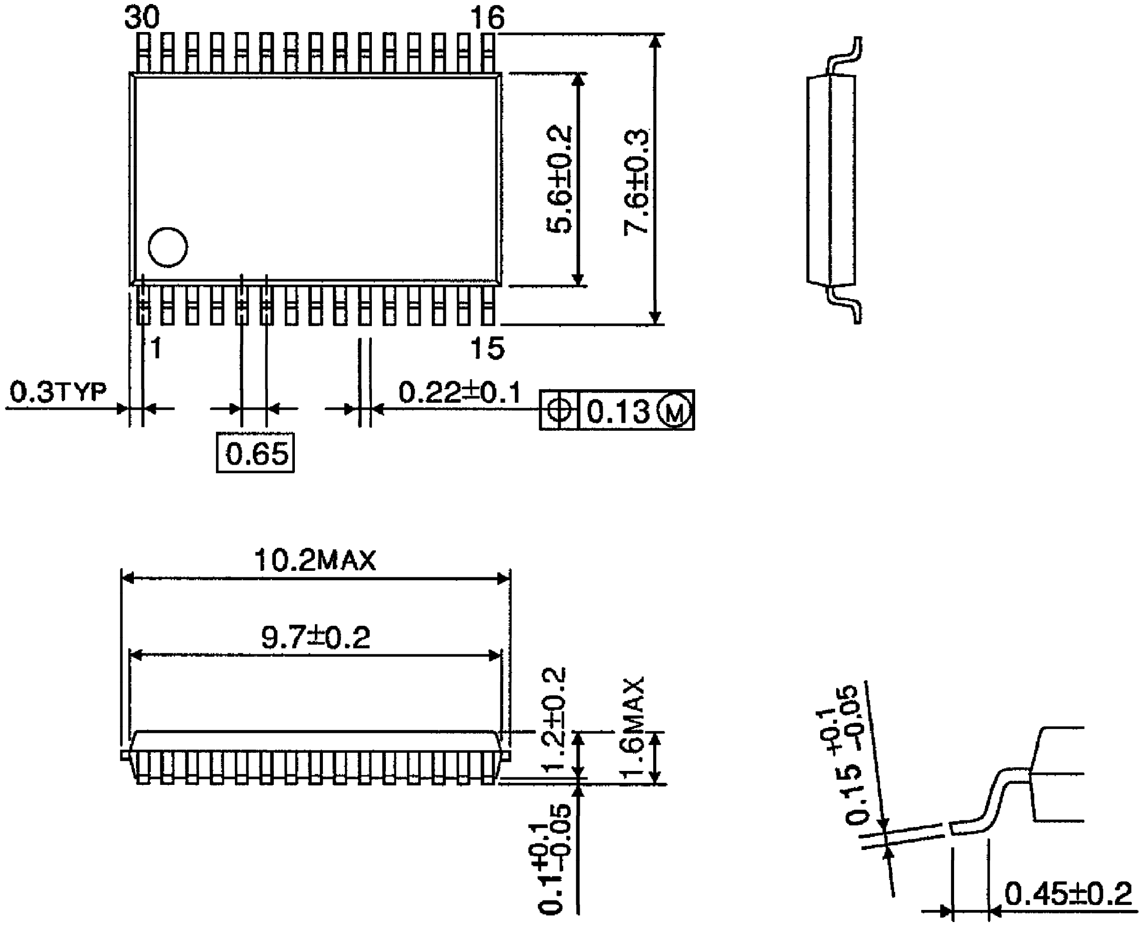


- V_{OFBL}
  Input $V_{RSB} = 1.5V$,
  $V_{RFB} = 1.5V \pm 7mV$, and check the switching of BOUT2 pin output function.
  BOUT2 : H when
  $V_{RFB} = 1.493V$.
  BOUT2 : L when
  $V_{RFB} = 1.507V$.

OUTLINE DRAWING

SSOP30-P-300-0.65

Unit : mm



Weight : 0.17g (Typ.)