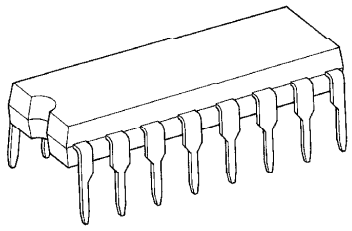
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA8532P, TA8532F

BATTERY CHARGER IC

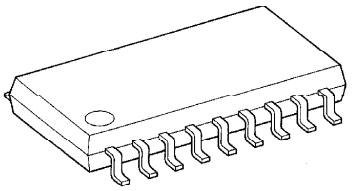
TA8532P, TA8532F is Battery Charger IC for Lead Batterys and applicable to various types from 1 to 6cells. Simple system with minimized external components is available.

TA8532P



DIP16-P-300-2.54A

TA8532F



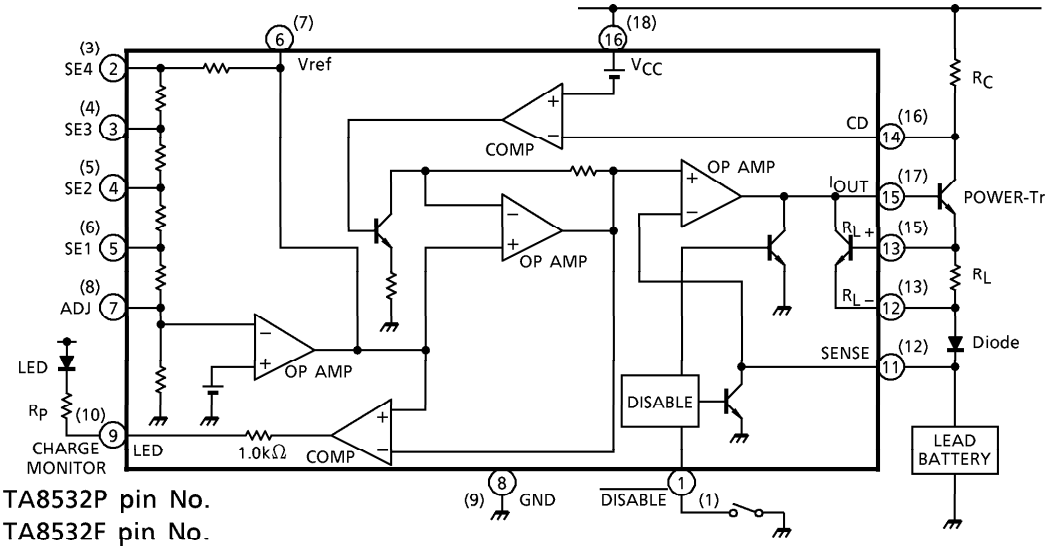
SOP18-P-375-1.27

Weight DIP16-P-300-2.54A : 1.0g (Typ.)
SOP18-P-375-1.27 : 0.5g (Typ.)

FEATURES

- Applicable to various types of lead battery from 1 to 6 cells utilizing selectable reference voltage.
- Reference voltage can be adjusted by external resistor.
- Charging time can be set freely by changing the external current (charging current) with the external resistor.
- Charging completion can be indicated by LED utilizing the charge monitor circuit.
- This device can be disabled externally.
- Battery discharge at power off can be protected by the reverse current protection system.

SYSTEM BLOCK DIAGRAM

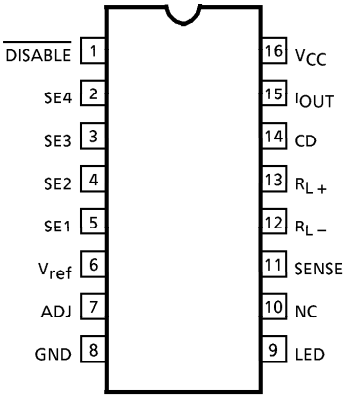


○ : TA8532P pin No.
( ) : TA8532F pin No.

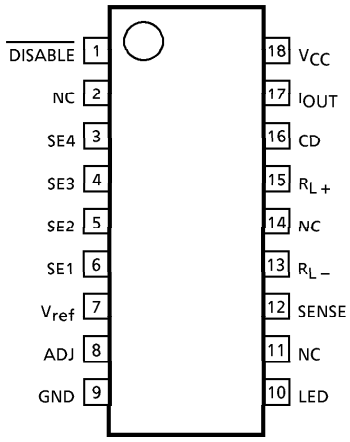
961001EBA2

PIN CONNECTION (TOP VIEW)

TA8532P



TA8532F

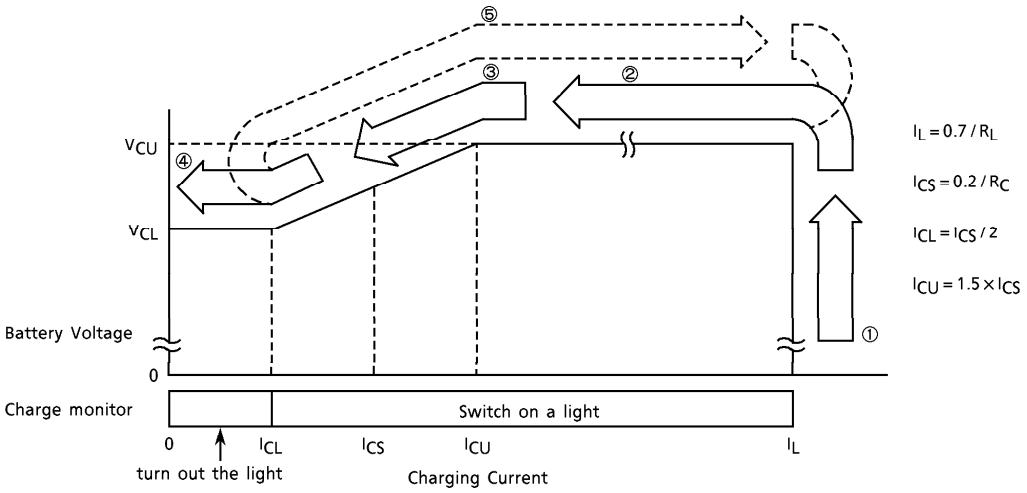


PIN FUNCTION

PIN No.	PIN NAME	FUNCTION
1 (1)	$\overline{\text{DISABLE}}$	To stop charging by L input.
2 (3)	SE4	Selection terminal for 5cells connecting with V_{ref} terminal.
3 (4)	SE3	Selection terminal for 4cells connecting with V_{ref} terminal.
4 (5)	SE2	Selection terminal for 3cells connecting with V_{ref} terminal.
5 (6)	SE1	Selection terminal for 2cells connecting with V_{ref} terminal.
6 (7)	V_{ref}	Standard Voltage Terminal.
7 (8)	ADJ	To adjust the V_{ref} terminal output. And 1cell is selected connecting with V_{ref} terminal through a variable resistor.
8 (9)	GND	Ground
9 (10)	LED	For the LED indication during the charging (Output current>I_{CL}).
11 (12)	SENSE	To sense the battery output voltage.
12 (13)	R_{L-}	For connection with the current the limiting resistance. The limiting current is given ($0.7 / R_L$).
13 (15)	R_{L+}	The current limiting resistor is connected between R_L.
14 (16)	CD	Connecting terminal for the current sense resistor and Power transistor. The resistor is to be connected to the internal current sense circuit and makes the slope $\Delta V_C / \Delta I_C$. It is also connected to the charge monitor circuit and control lighting LED.
15 (17)	I_{OUT}	The charging current output terminal. The emitter of Power transistor to be connected.
16 (18)	V_{CC}	Power Supply Voltage Terminal.

( ) : TA8532F pin No.

CHARGING PROCESS CHART



I_L	Determined by the external resistor R_L.
I_{CS}	Determined by the external resistor R_C.
I_{CL}	Almost the center between I_{CS} and OmA.
I_{CU}	Almost triple of I_{CL}.
V_{CU}	Charging Voltage. Dependent on the number of the battery cells. Refer to the chart in the next page.
V_{CL}	Fouging Voltage. Dependent on the number of the battery cells. Refer to the chart in the next page.

OPERATION

(1) As shown in the above chart, charging starts with maximum current I_L (given by the formula 0.7 / R_L) and the battery voltage increases gradually.

(2) When the battery voltage reaches V_{CU} (Charging Voltage), the voltage is fixed at V_{CU}, that is the constant voltage charging state. And the charging current decreases gradually.

(3) When the charging current decreases to the point of I_{CU}, the voltage starts dropping. The voltage dropping continues until the current reaches I_{CL}, and is settled at the Focusing Voltage (V_{CL}). And the voltage dropping ratio is given by the formula $(V_{CU} - V_{CL}) / (I_{CU} - V_{CL})$ and it's center is V_{CS} and I_{CS}.

(4) The center of the voltage dropping curve is I_{CS}, which is given by the formula 0.2 (R_C : External Resistor).

(5) LED indicates as a charging monitor during the charging current is greater than I_{CL}. When it becomes lower than I_{CL}, LED turns off for the indication of charging completion. Internal resistance is 1kΩ and external resistor is needed at $V_{CC} \geqq 15V$.

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC		SYMBOL	RATING	UNIT
Supply Voltage		V_{CC}	24	V
Max. Pre-drive Output Current		I_{out}	20	mA
Power Dissipation	TA8532P	P_D	1	W
	TA8532F		0.9	
Operating Temperature		T_{opr}	−30~75	°C
Storage Temperature		T_{stg}	−55~150	°C

RECOMMENDED OPERATING CONDITION

CHARACTERISTIC		SYMBOL	MIN.	TYP.	MAX.	UNIT
Power Supply Voltage	1Cell Charge	V_{CC}	9	—	20	V
	2Cells Charge		9	—	20	
	3Cells Charge		11	—	20	
	4Cells Charge		13.5	—	20	
	5Cells Charge		16	—	20	
	6Cells Charge		18.5	—	20	

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, V_{CC} = 9~20V, Ta = 25°C)

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Power Supply Current		I_{CC}	1	V_{CC} = 9V	—	6.7	—	mA
				V_{CC} = 20V	—	7.0	10	
Output Current		I_{out}	2	—	20	40	—	mA
LED Output Current		I_{LED}	3	V_{CC} = 20V, V_{LED} = 7V	—	6.0	—	mA
				V_{CC} = 20V, V_{LED} = 18V	10	16	—	
Limiter Output Detection Voltage		V_{Lim}	4	—	—	0.7	—	V
Voltage Switching Detection Voltage		V_C	5	—	—	0.2	—	V
Non-adjustment Focusting Voltage Error	2Cells Charge	ΔV_{CL}	—	V_{CC} = 20V, V_{CL} = 4.550V	−8	—	8	%
	3Cells Charge			V_{CC} = 20V, V_{CL} = 6.825V	−8	—	8	
	4Cells Charge			V_{CC} = 20V, V_{CL} = 9.100V	−8	—	8	
	5Cells Charge			V_{CC} = 20V, V_{CL} = 11.375V	−8	—	8	
	6Cells Charge			V_{CC} = 20V, V_{CL} = 13.650V	−8	—	8	
Non-adjustment Charging Voltage Error	2Cells Charge	ΔV_{CU}	—	V_{CC} = 20V, V_{CU} = 4.90V	−10	—	10	%
	3Cells Charge			V_{CC} = 20V, V_{CU} = 7.35V	−10	—	10	
	4Cells Charge			V_{CC} = 20V, V_{CU} = 9.80V	−10	—	10	
	5Cells Charge			V_{CC} = 20V, V_{CU} = 12.25V	−10	—	10	
	6Cells Charge			V_{CC} = 20V, V_{CU} = 14.70V	−10	—	10	
Output Voltage Adjustment Width		Ara	—	—	−10	—	10	%
SENSE Terminal Reverse Current		I rev	6	—	—	0.1	10	μA
Disable Terminal "H" Voltage		$V_{DIS\ H}$	—	—	2.0	—	—	V
Disable Terminal "L" Voltage		$V_{DIS\ L}$	—	—	—	—	0.8	V

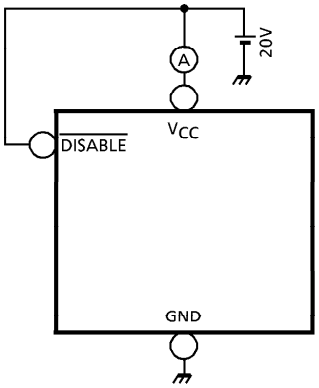
STANDARD VOLTAGE ADJUSTMENT

NUMBER	V_{CL} (V)	V_{CU} (V)	V_{ref} TERMINAL CONECTION
1Cell	2.275 ± 0.025	2.45 ± 0.07	V_{ref}-ADJ
2Cells	4.550 ± 0.050	4.90 ± 0.14	V_{ref}-SE1, ADJ
3Cells	6.825 ± 0.075	7.35 ± 0.21	V_{ref}-SE2, ADJ
4Cells	9.100 ± 0.100	9.80 ± 0.28	V_{ref}-SE3, ADJ
5Cells	11.375 ± 0.125	12.25 ± 0.35	V_{ref}-SE4, ADJ
6Cells	13.650 ± 0.150	14.70 ± 0.42	V_{ref} OPEN, ADJ

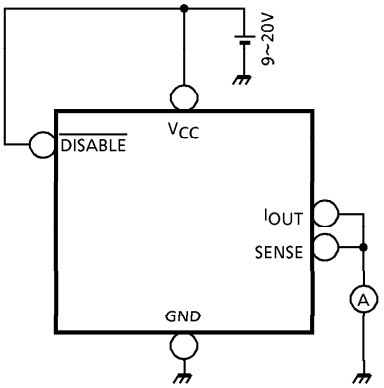
(Note 1) The ADJ terminal is to be connected through valuable resistor and controlled.
(Note 2) Adjustment is to be done in accordance with the above forcusing voltage.

TEST CIRCUIT

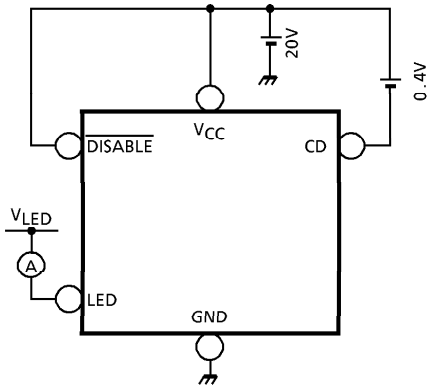
(1) I_{CC}



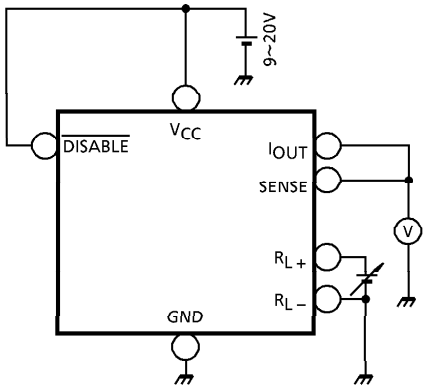
(2) I_{OUT}



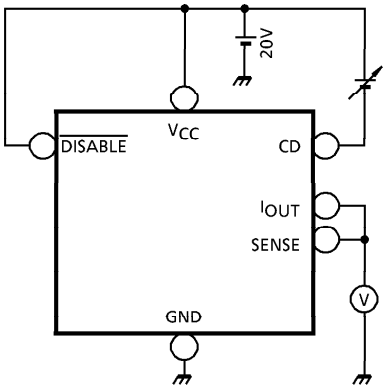
(3) I_{LED}



(4) V_{Lim}



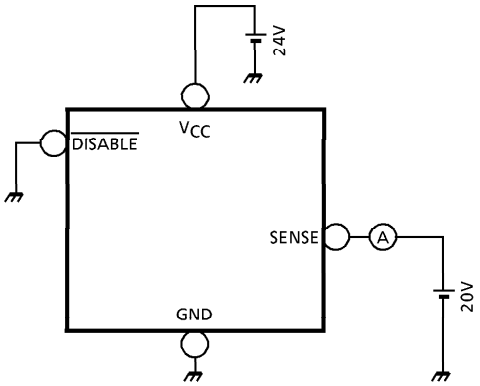
(5) V_C



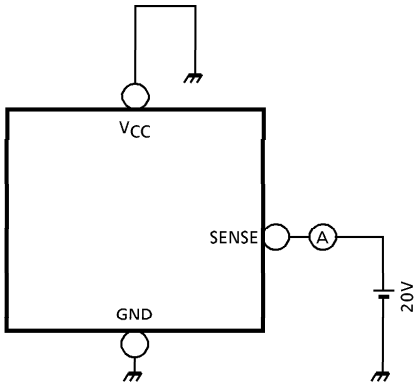
- V_{CC}-CD
  V_{CH} : 0.4V
  V_{CL} : 0V

(6) I rev

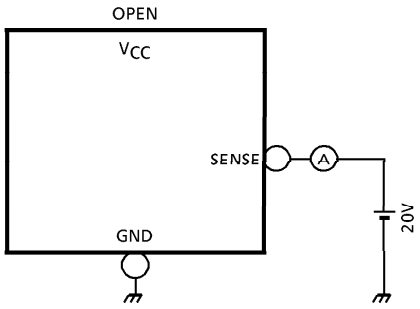
- V_{CC} = 24V



- V_{CC} = GND

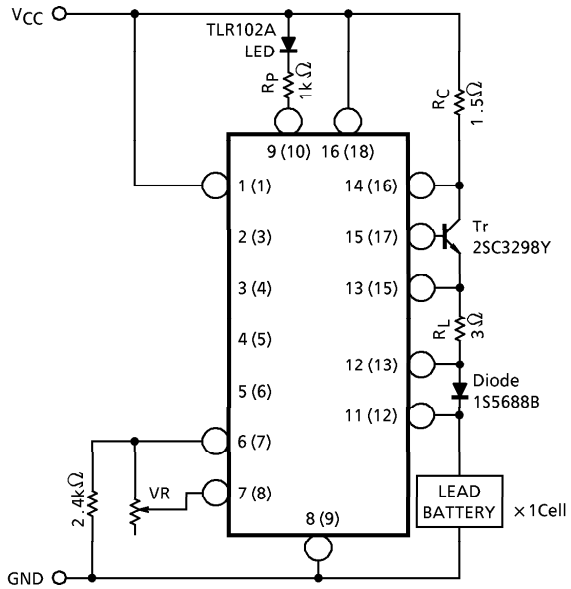


- V_{CC} = OPEN

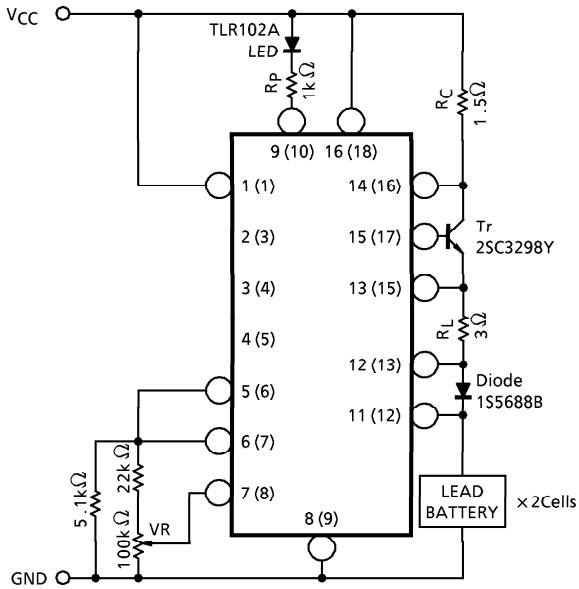


APPLICATION

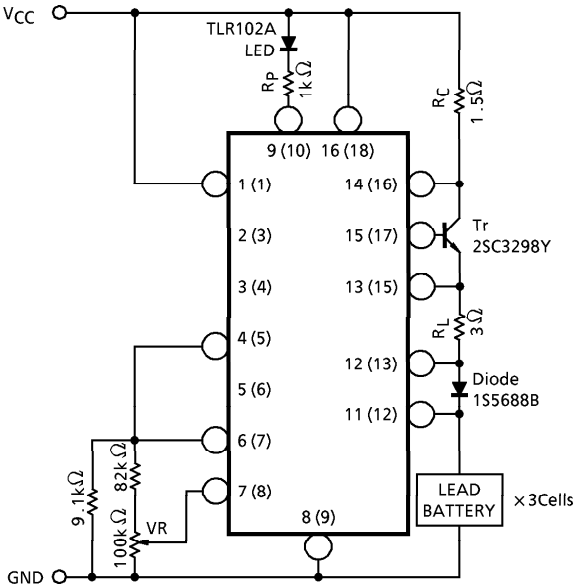
(1) 1Cell



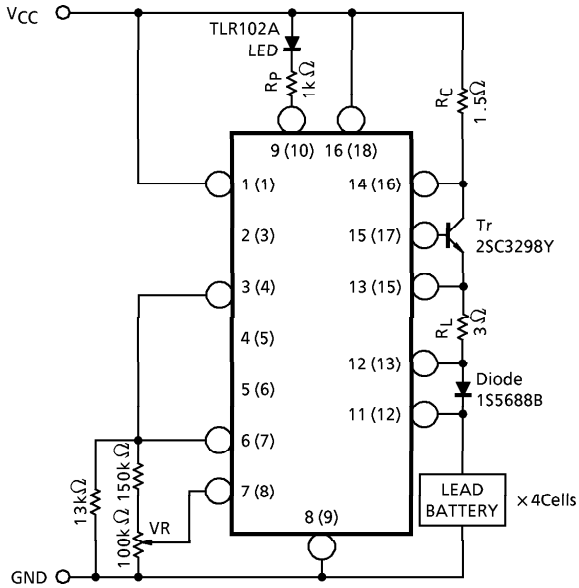
(2) 2Cells



(3) 3Cells

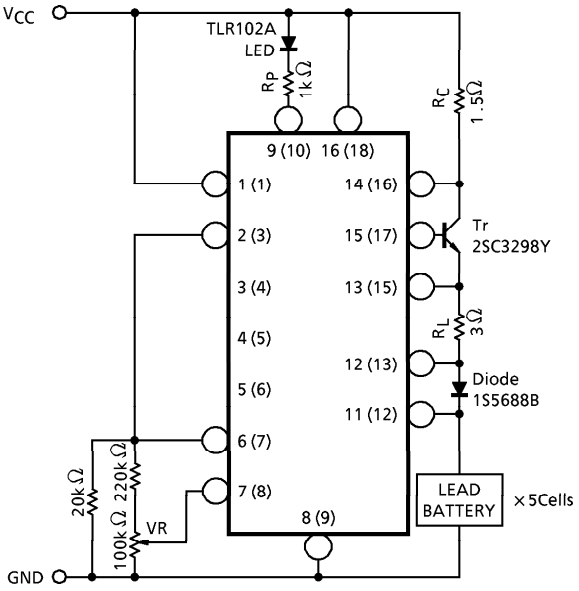


(4) 4Cells

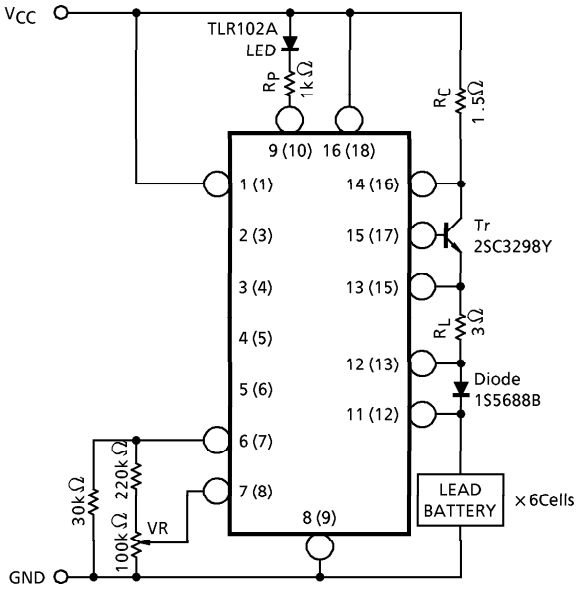


( ) : TA8532F pin No.

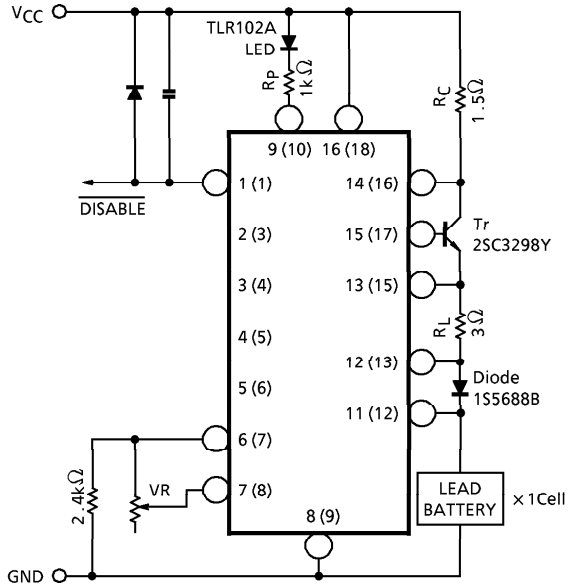
(5) 5Cells



(6) 6Cells



(7) DISABLE (ex. 1Cell)

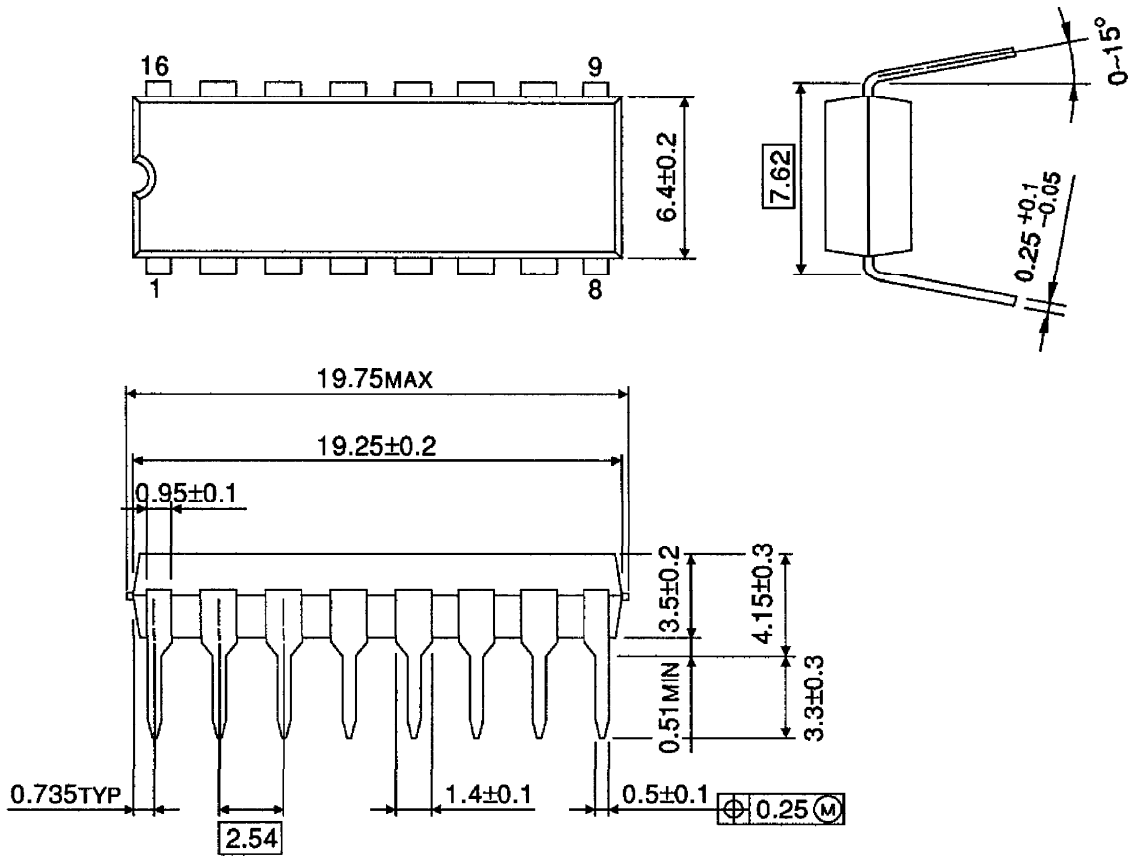


( ) : TA8532F pin No.

OUTLINE DRAWING

DIP16-P-300-2.54A

Unit : mm

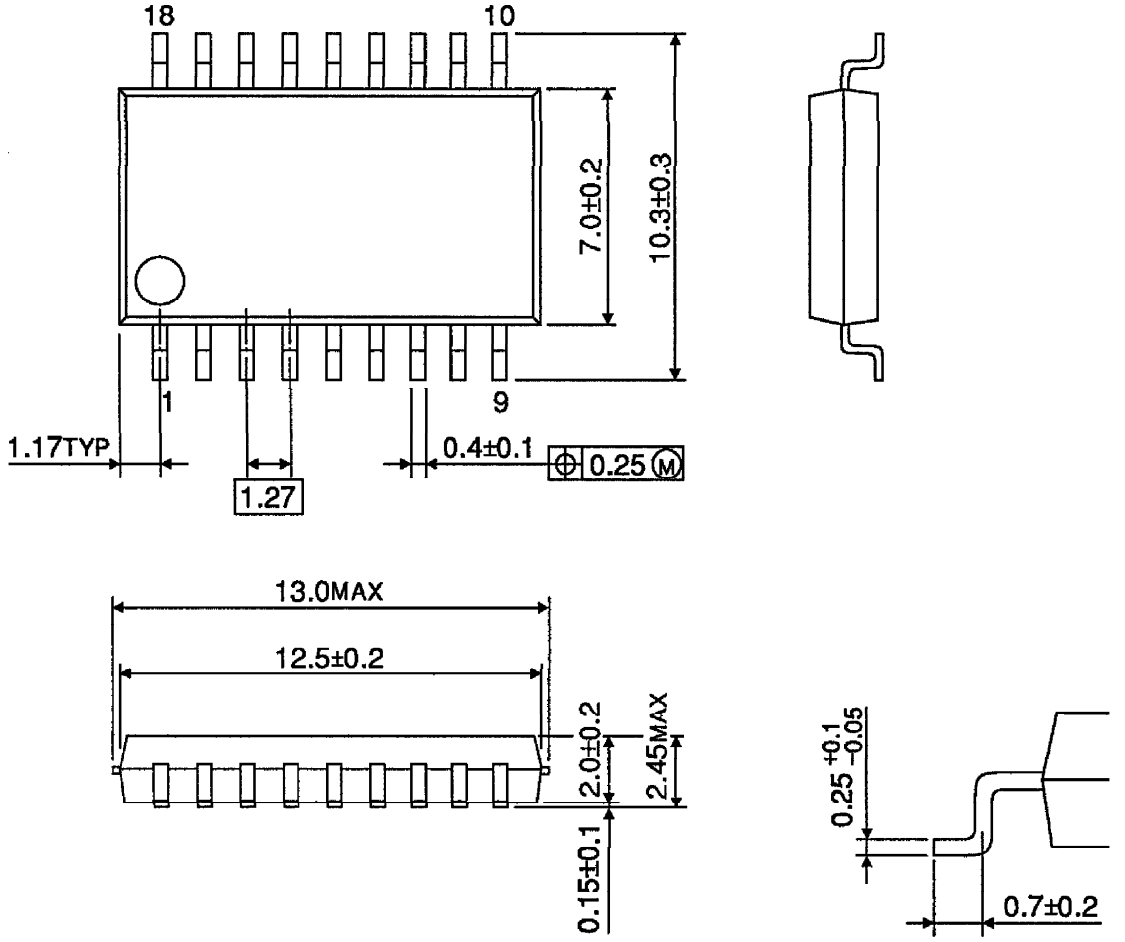


Weight : 1.0g (Typ.)

OUTLINE DRAWING

SOP18-P-375-1.27

Unit : mm



Weight : 0.5g (Typ.)