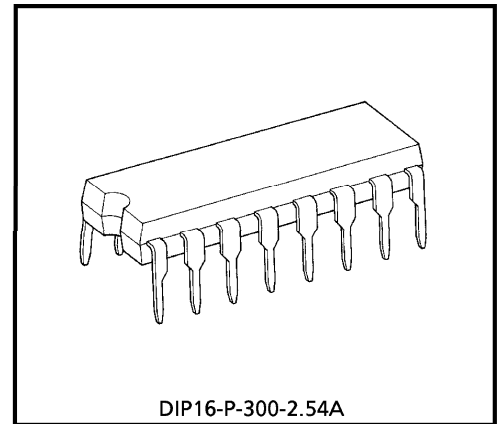


# TA7715P

## FREQUENCY TO VOLTAGE CONVERTER

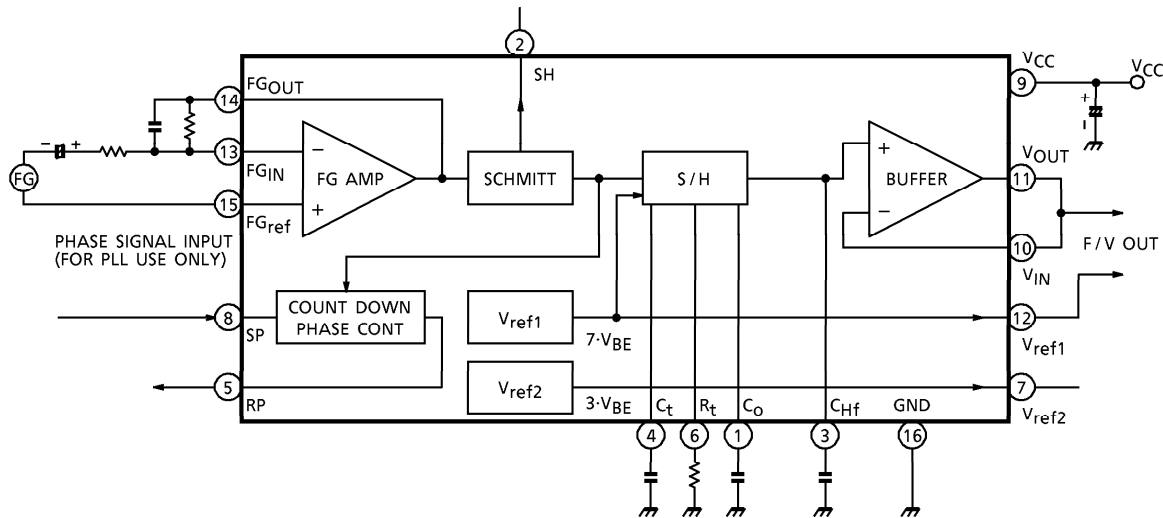
The TA7715P is a general purpose F-V converter designed for FDD, VTR, ATR and player F-servo system use. It contains High Gain Input Amplifier, Hysteresis Amplifier (for wave form shapping), and Sample-and-Hold type F-V conversion amplifier.



DIP16-P-300-2.54A

Weight : 1.11g (Typ.)

### BLOCK DIAGRAM



980910EBA1

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## PIN FUNCTION

PIN No.	SYMBOL	FUNCTIONAL DESCRIPTION
1	$C_O$	Capacitor connection terminal for setting time constants (for F/V Amp.)
2	SH	Schmitt Amp. output terminal
3	$C_{Hf}$	Capacitor connection terminal forgetting time constants (for F/V buffer Amp.)
4	$C_t$	Capacitor connection terminal for setting time constants
5	RP	Phase control signal output terminal
6	$R_t$	Resistor connection terminal for setting time constants
7	$V_{ref2}$	Internal reference voltage output terminal
8	SP	Phase control signal input terminal
9	$V_{CC}$	Power supply input terminal
10	$V_{IN}$	Buffer Amp. negative input terminal
11	$V_{OUT}$	Buffer Amp. output terminal
12	$V_{ref1}$	F/V Amp. reference voltage output terminal
13	$FG_{IN}$	FG Amp. negative-side input terminal
14	$FG_{OUT}$	FG Amp. output terminal
15	$FG_{ref}$	FG Amp. positive-side input terminal
16	GND	GND terminal

## OPERATION

TA7715P outputs control signals (F/V conversion output) generated by the sample and hold (S/H) circuit for each cycle of the frequency signal output.

Consequently, TA7715P offers a superior response to methods counting the monostable multivibrator cycles or the input signal cycles to drive a D/A converter and output a latched result. Fig.1 shows the input FG amp circuit, which amplifies the weak FG signal.

The Schmitt circuit in the next stage has the required hysteresis for wave-shaping and generates the signals needed for S/H.

S/H operations are based on the waveform-shaped FG output from the SH terminal (pin②). That is, the time constant capacitor  $C_t$  (pin④) is momentarily charged to the internal reference voltage  $10 \cdot V_{BE}$  when the SH pulse (pin②) falls.

The hold pulse and reset pulse required for the S/H operation are generated by the voltage of this capacitor. The hold pulse is output until the voltage falls to  $9 \cdot V_{BE}$ . The reset pulse is output while the voltage is falling between  $9 \cdot V_{BE}$  and  $5 \cdot V_{BE}$ .

The voltage of the  $C_t$  is discharged by the constant current ( $I_{O2}$ ), which is determined by resistor  $R_t$  connected to the  $R_t$  terminal (pin⑥).

The S/H operation is based on the hold and reset pulses generated by the changes in the  $C_t$  voltage.

First, capacitor  $C_O$ , which is connected to the  $C_O$  terminal (pin①), is momentarily charged to  $10 \cdot V_{BE}$  by the reset pulse and discharged by the constant current ( $I_{O3}$ ), which is determined by  $R_t$ . F/V conversion is performed by designating the discharge time as the time from the reset pulse fall to the hold pulse rise.

In other words, the F/V conversion output is performed by retaining the  $C_O$  terminal output with the hold pulse. (Fig.3)

The  $C_O$  output is transferred to  $C_{Hf}$  in the circuit and output through the buffer amp. The buffer amp output ( $V_{OUT}$  pin, pin⑩) changes to  $\pm 3 \cdot V_{BE}$  with  $7 \cdot V_{BE}$  as the center, that is, within the range of  $4 \cdot V_{BE} \sim 10 \cdot V_{BE}$ , according to the input frequency. Thus, the F/V conversion output is obtained by the output differential with the potential of the  $V_{ref1}$  terminal (pin⑫), which has a reference voltage of  $7 \cdot V_{BE}$ .

In addition, the conversion output can be amplified by the buffer amp using direct current. The gain in the Fig.2 example is a multiple of  $((R_a + R_b) / R_b)$ .

Although unlike  $C_O$ ,  $C_t$ , and  $R_t$ , the  $C_{Hf}$  value does not need to be precise, too large a value causes deterioration in response characteristics.

Too small a value causes F/V conversion error due to leakage.

If the FG frequency is in the range of 500~1kHz, use the values indicated in the application circuits.

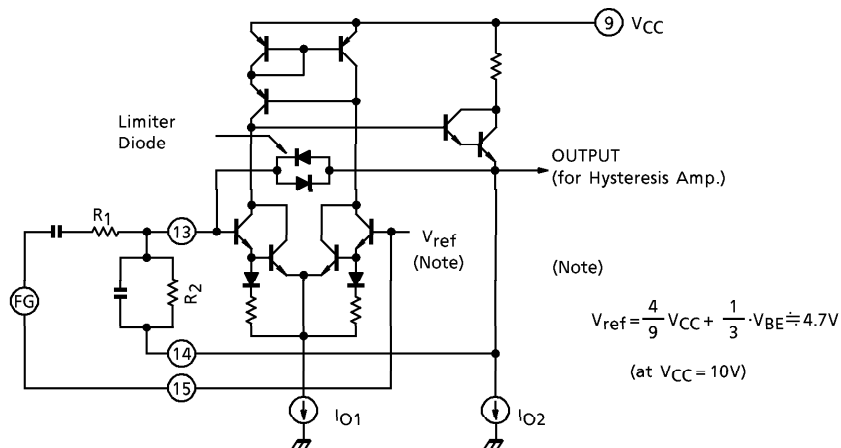


Fig.1 FG Amp.

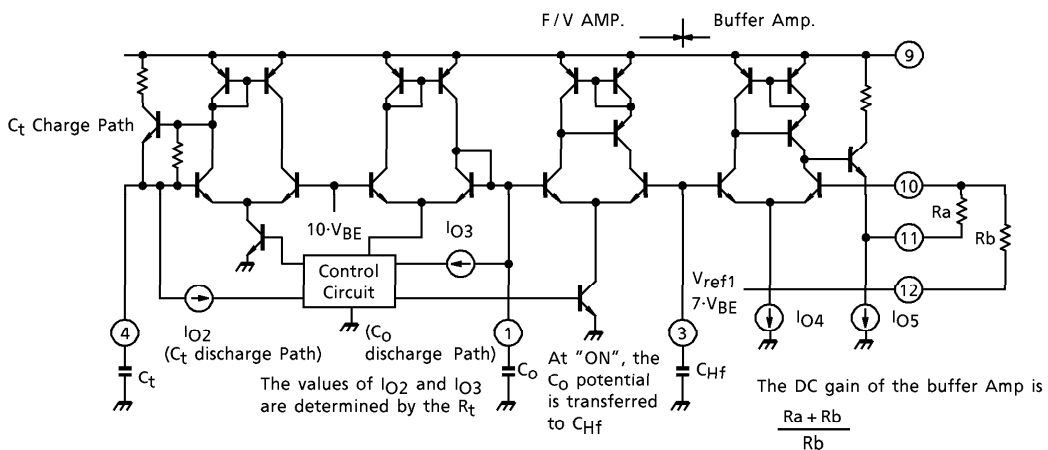


Fig.2 S/H, buffer Amp.

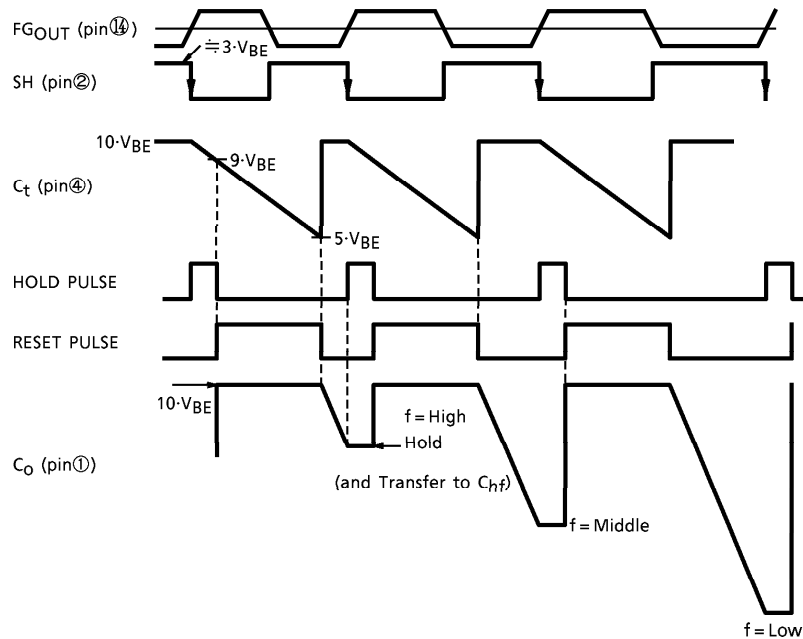


Fig.3 Timing chart

**MAXIMUM RATINGS** (Ta = 25°C)

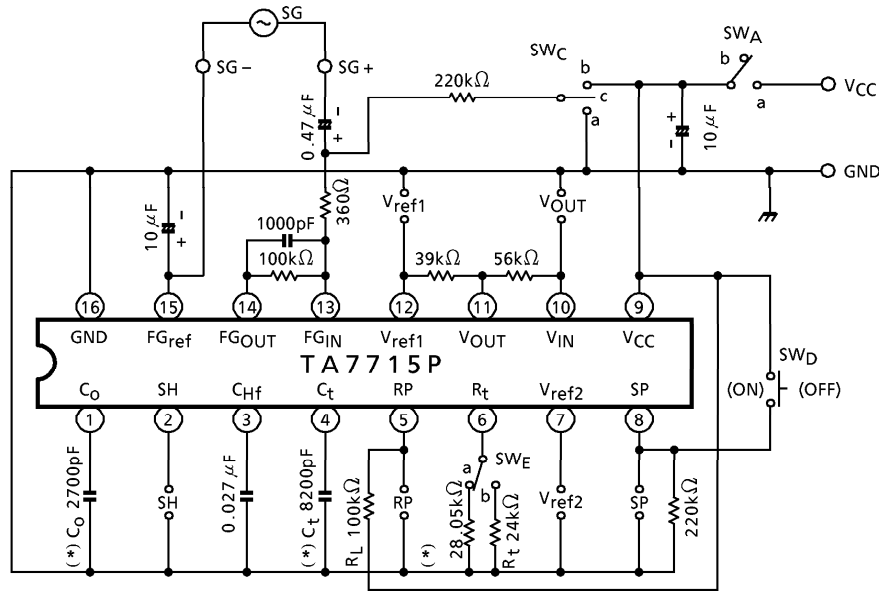
CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V <sub>CC</sub>	15	V
Power Dissipation (Note)	P <sub>D</sub>	750	mW
Operating Temperature	T <sub>opr</sub>	- 25~75	°C
Storage Temperature	T <sub>stg</sub>	- 55~150	°C

(Note) Derated above Ta = 25°C in the proportion of 6mW / °C.

**ELECTRICAL CHARACTERISTICS** (Unless otherwise specified, V<sub>CC</sub> = 10V, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Voltage Range	V <sub>CC (opr)</sub>	—	e <sub>i</sub> = 2mV <sub>rms</sub> , f = 726Hz	9	10	12	V
Supply Current	I <sub>CC</sub>	—		2.5	—	10	mA
Input Sensing Voltage	V <sub>IN</sub>	—	f = 726Hz	0.35	—	2.5	mV <sub>rms</sub>
Reference Voltage	V <sub>ref1</sub>	—	—	4.0	5.0	6.0	V
	V <sub>ref2</sub>			1.5	2.0	2.5	
F/V Converter Output Voltage	V <sub>OUT</sub>	—	e <sub>i</sub> = 2mV <sub>rms</sub> , f = 726Hz R <sub>f</sub> = 27.6kΩ	- 0.5	0	0.5	V
F/V Converter Output Noise Voltage	V <sub>NF</sub>	—	e <sub>i</sub> = 2mV <sub>rms</sub> , f = 726Hz	—	—	5	mV <sub>rms</sub>
Max. Output Voltage	V <sub>FH</sub>	—	e <sub>i</sub> = 2mV <sub>rms</sub> , f = 900 ± 10Hz	2.5	—	—	V
	V <sub>FL</sub>		e <sub>i</sub> = 2mV <sub>rms</sub> , f = 580 ± 10Hz	—	—	- 2.2	
RP Saturation Voltage	V <sub>RP (sat)</sub>	—	R <sub>L</sub> = 100kΩ	—	—	0.3	V

TEST CIRCUIT

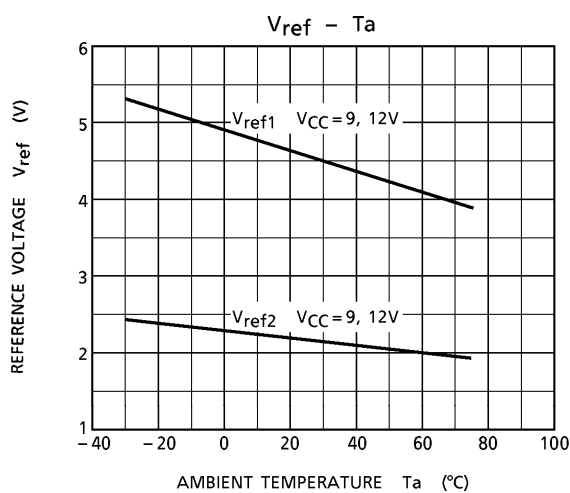
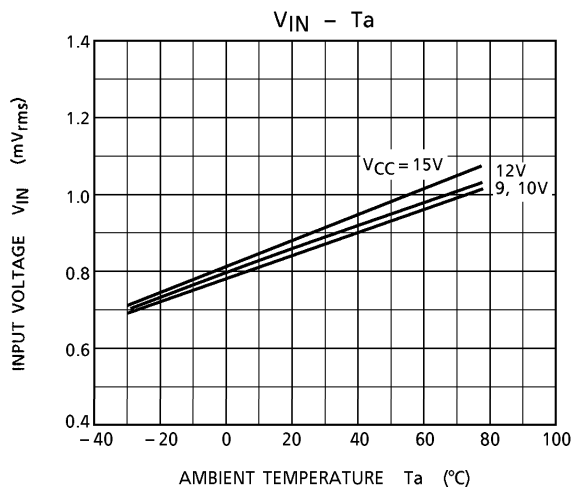
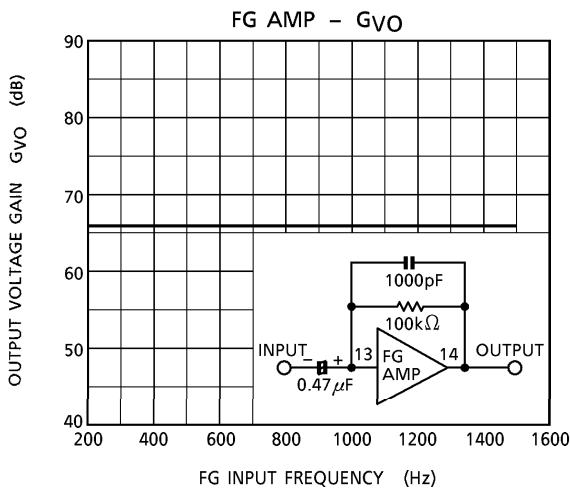
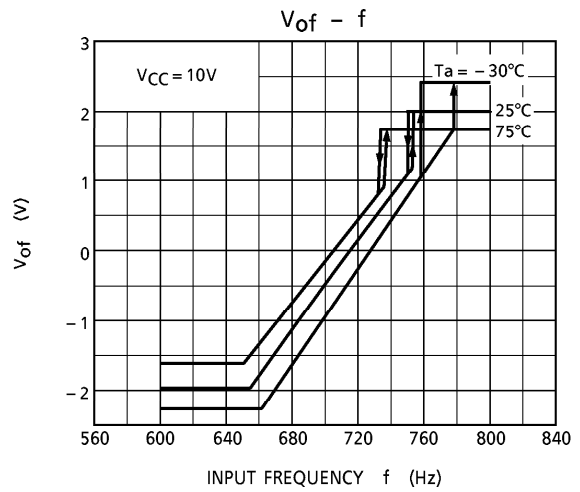
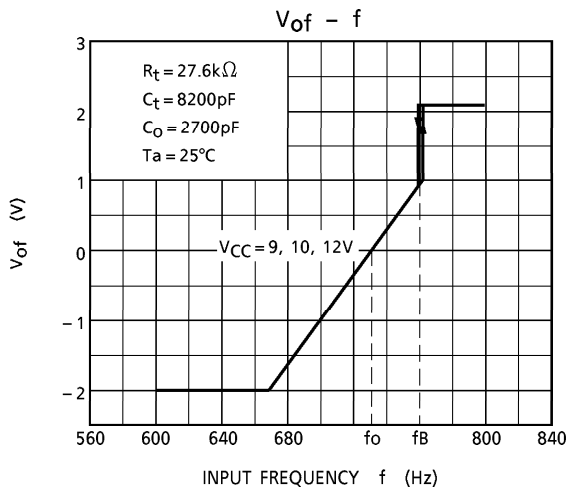


(\*) ±1% ACCURACY IS REQUIRED

MEASURING METHOD

- (1) Operating voltage range  
F/V conversion must be performed when  $V_{CC}$  is set between 9~12V with  $e_i = 2mV_{rms}$  and  $f = 726Hz$ . At this time,  $SW_A$  is set to a,  $SW_C$  to OFF,  $SW_D$  to OFF, and  $SW_E$  to a.
- (2) Power supply current  
In state (1), read power supply current.
- (3) Input operating voltage  
In state (1), read the input level when the input level is gradually increased and the SH terminal is in operating mode (confirm square wave output of  $f = 726Hz$  with amplitude of about 3V).
- (4) Reference voltage 1  
In state (1), read the DC voltage of  $V_{ref1}$  terminal.
- (5) Reference voltage 2  
In state (1), read the DC voltage of  $V_{ref2}$  terminal.
- (6) F/V conversion output voltage  
In state (1), read the voltage between terminal  $V_{ref1}$ - $V_{OUT}$ . Set  $R_t = 27.6k\Omega$ .
- (7) F/V conversion output noise voltage  
In state (1), read the AC voltage of pin⑩.
- (8) Maximum output voltage  
In state (1), set the input frequency to the specified value and read the voltage between terminal  $V_{ref1}$ - $V_{OUT}$ .
- (9) RP saturation voltage  
In state (8), set the SP terminal to "OPEN" and read the DC voltage when the RP terminal is set to "ON".

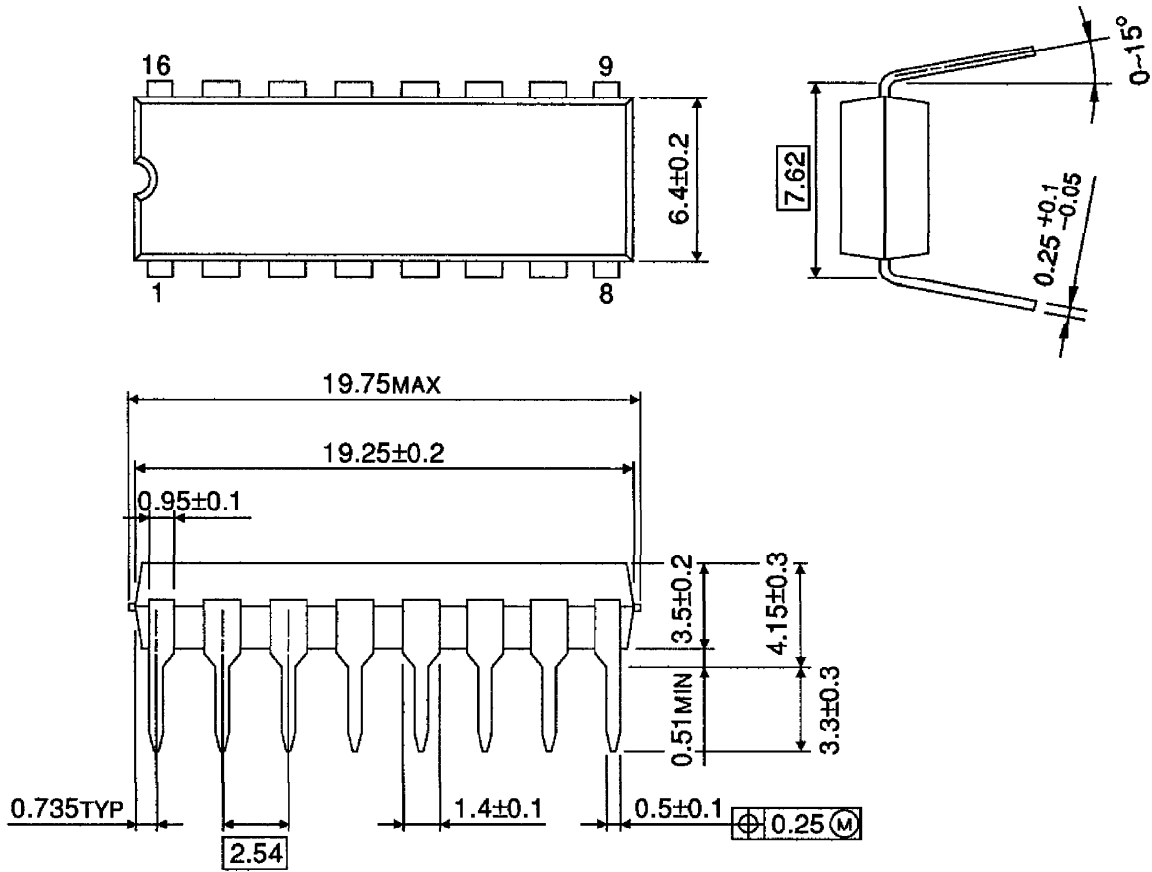
Load resistor  $R_L$  should have the specified value and be connected directly to the  $V_{CC}$  terminal. If the RP terminal is "OFF", set the  $SW_D$  to "ON" and measure the RP saturation voltage.





PACKAGE DIMENSIONS  
DIP16-P-300-2.54A

Unit : mm



Weight : 1.11g (Typ.)