APPLICATION MANUAL

High Speed Communication FM IF IC
TK14565AV

CONTENTS

MEETING YOUR NEEDS
TOKO, INC.

High Speed Communication FM IF IC
TK14565AV

1. DESCRIPTION

The TK14565AV is a highly suitable FM IF IC for cordless phones, amateur radio transceivers, and other high speed communications equipment.
It includes an IF Limiter Amplifier, RSSI, Buffer Amplifier for RSSI, Wide Band FM Demodulator, and Power Save Function.
Its package is very small and its operating voltage is low. It is recommended for use in various communications equipment which require high density mounting and/or low power dissipation.

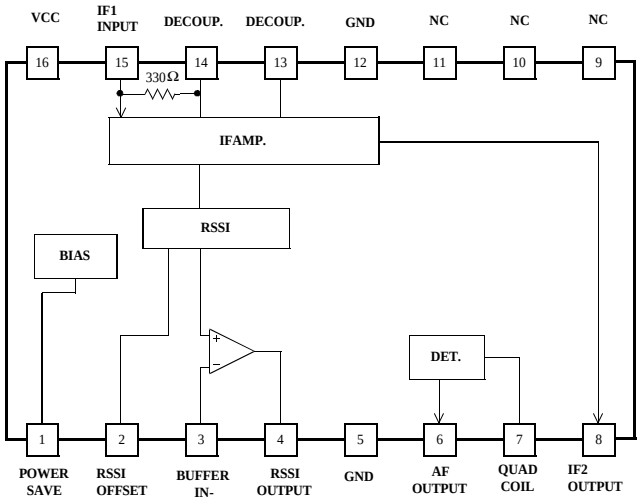
2. FEATURES

- Low Operating Voltage: 1.8V~5.5V
- Power Save Function: I_{CC}=0mA@Stand-by
- IF Input Frequency: Up to 11MHz
- Programmable RSSI Offset Voltage
- Programmable RSSI Buffer Amplifier Gain.
- Wide Band FM Demodulator: Up to 1MHz
- Very Small Package: TSSOP-16

3. APPLICATIONS

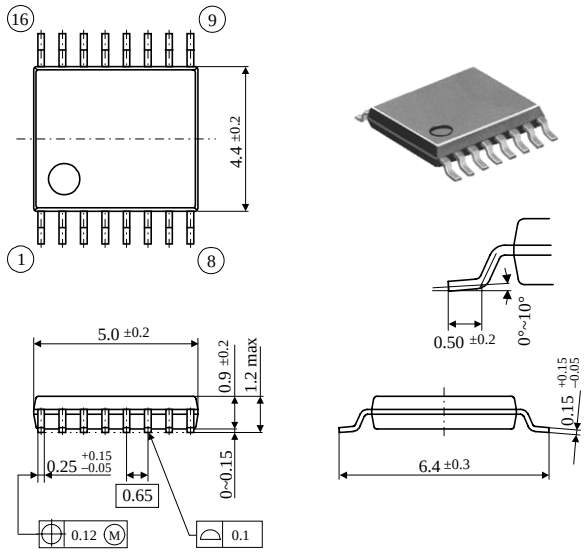
- Cordless Phone
- Amateur Radio Transceiver
- Other High Speed Communications Equipment

4 .BLOCK DIAGRAM / PIN CONFIGURATION



5. PACKAGE OUTLINE

- TSSOP-16



Unit : mm

6. ABSOLUTE MAXIMUM RATINGS

T_a=25°C

Parameter	Symbol	Rating	Units	Conditions
Supply Voltage	V_{CC}	10	V	
Power Dissipation	P_D	160	mW	*
Storage Temperature Range	T_{stg}	-55~+150	°C	
Operating Temperature Range	T_{OP}	-30~+60	°C	
Input Frequency	f_{MAX}	~11	MHz	
Operating Voltage Range	V_{OP}	1.8~5.5	V	

* P_D must be decreased at rate of 1.28mW/°C for operation at 25°C.

7. ELECTRICAL CHARACTERISTICS

V_{CC}=3.0V, Ta=25°C, f=10.7MHz, DEV=±99kHz, fm=1kHz

Parameter	Symbol	Value			Units	Conditions
		MIN	TYP	MAX		
Supply Current 1	I_{CC} 1	3.3	4.3	5.5	mA	No input
Supply Current 2	I_{CC} 2	-	0	0.1	mA	No input Power save mode
IF Input Resistance	Rin	250	330	410	Ω	DC measurement
IF Gain	G	69.5	73.0	77.0	dB	
RSSI Output Voltage 1	V_{RSSI} 1	0.05	0.30	0.55	V	IF input : -100dBm *2
RSSI Output Voltage 2	V_{RSSI} 2	0.25	0.50	0.75	V	IF input : -60dBm *2
RSSI Output Voltage 3	V_{RSSI} 3	0.80	1.10	1.35	V	IF input : -20dBm *2
RSSI of offset voltage change Range	ΔV	0.14	0.2	0.26	V	IF input :-60dBm RSSI output voltage difference of Roff=30kΩ and open. *2
Detector Output Limiting Sensitivity	Limit	-81.0	-77.0	-73.5	dBm	Detecting phase output : -3dB point
Detector Demodulation Output Voltage	$V_{O(DET)}$	60	100	150	mVrms	
Detector Output Total Harmonic Distortion	THD	-	0.3	3	%	
Detector Output Higher Cutoff Frequency	f_{CH}	0.8	1.0	1.2	MHz	-3dB point (It is based on 1kHz modulated output) *4 *5
Detector Output PS Rise Time	tr	-	-	50	µSec	*1 *3 *4

*1 : When using IF decoupling capacitors (C13, C14) with a 10% tolerance. Measured by the constant of the test circuit.
A 1kHz rectangular wave with a 50% duty ratio is inputted as the PS signal.

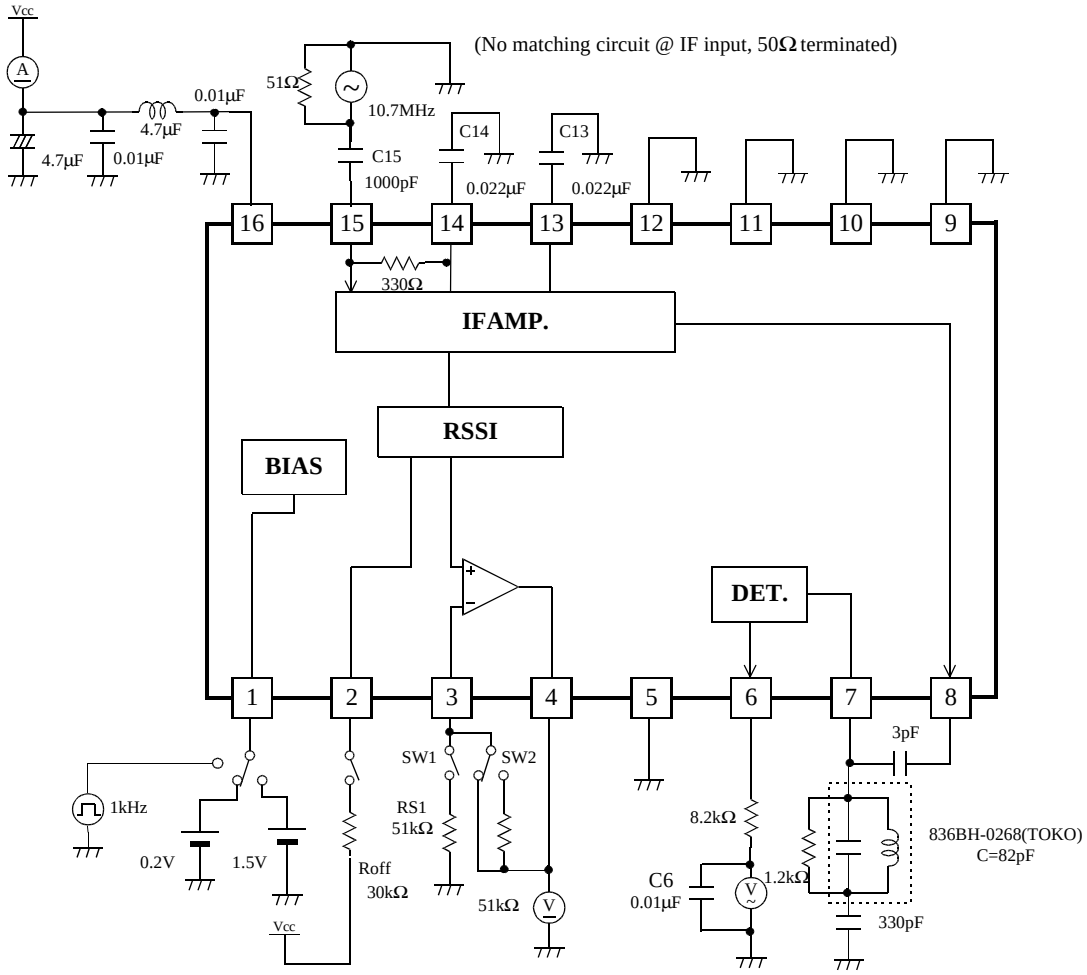
*2 : The RSSI output uses the buffer amplifier as a voltage follower.
(SW1: OFF, SW2: short to pin 4)

*3 : The time to be 90% of following recovery output voltage, which is based on the voltage that is 200µsec after the PS terminal voltage exceeds 1.8V. The recovery frequency is 500kHz.

*4 : It is measured with Capacitor C6 of the AF output terminal removed.

*5 : Phase shifter dumping resistance R_D=330Ω, Measured by the IF input DEV=±400kHz.

8. TEST CIRCUIT

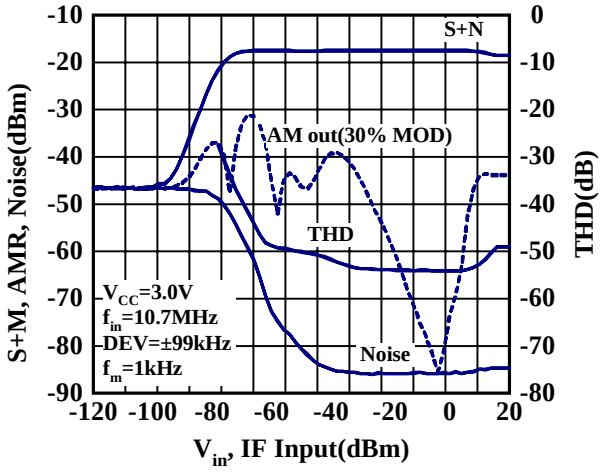


* In order to realize this IC's original specification, the pin 16 bypass capacitor and the IF decoupling capacitors C13~14 must be connected to ground close to the GND pin.

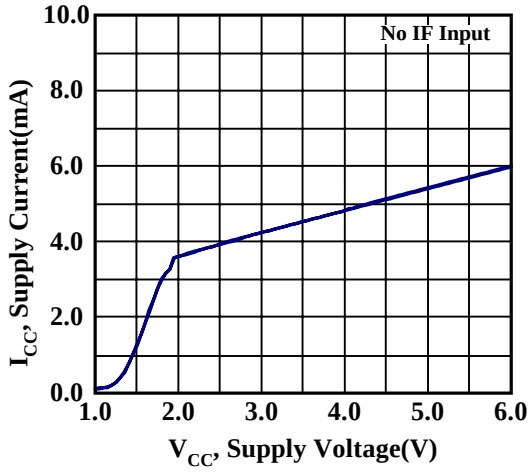
* Contact us in detail, if high speed operation is needed.

9. TYPICAL CHARACTERISTICS

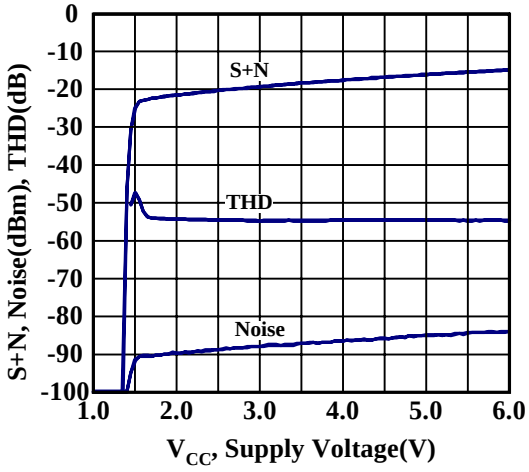
■ S+N, AMR, Noise, THD versus IF Input



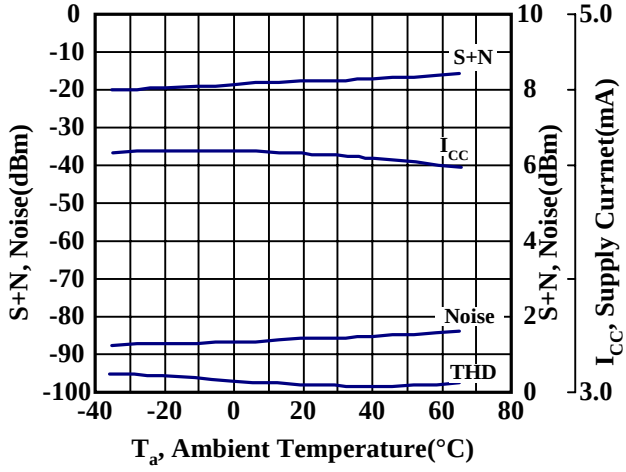
■ Supply Current versus Supply Voltage



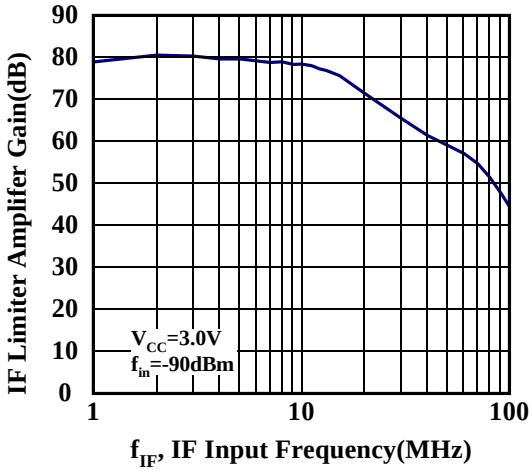
■ S+N, N, THD versus Supply Voltage



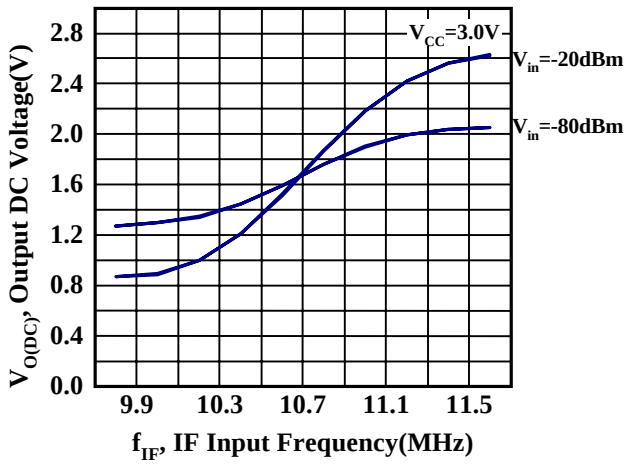
■ S+N, I_{CC}, N, THD versus Ambient Temperature



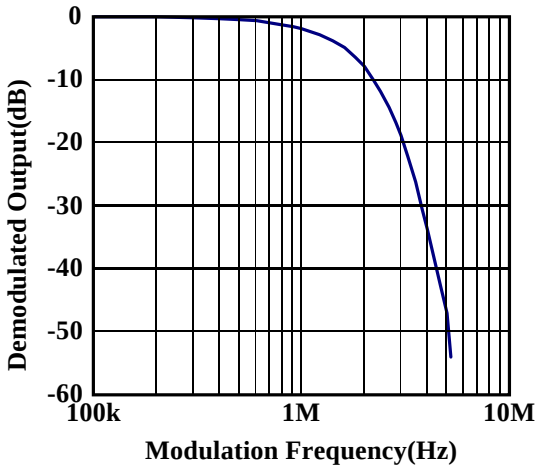
■ IF Limiter Amplifier Gain versus IF Input Frequency



■ S Curve



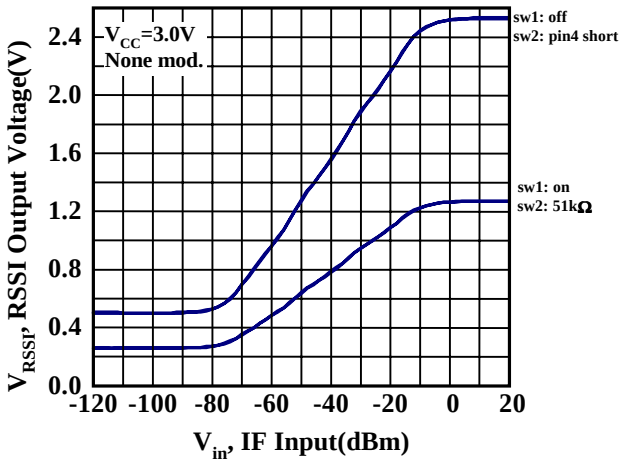
■ Output Voltage versus Modulation Frequency



V_{CC}=3.0V
V_{in}=-20dBm
f_{in}=10.7MHz
DEV.=±400kHz
R_d=330Ω

* C6 is removed.

■ RSSI Output Voltage versus IF Input

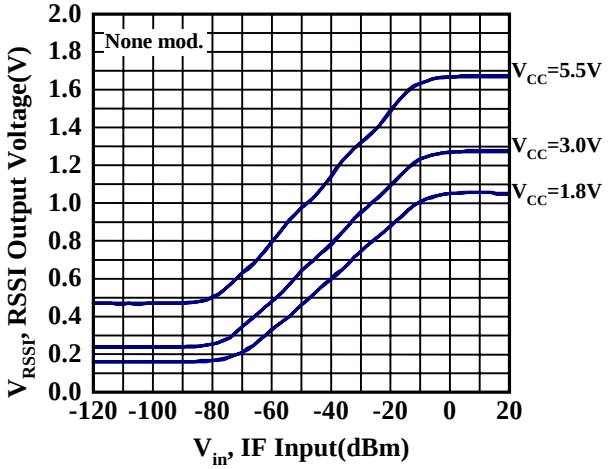


The RSSI output voltage is the RSSI buffer amplifier output voltage.
By directly connecting pins 3 and 4, the RSSI buffer becomes a buffer amplifier (gain=1). The gain is also programmable by external resistor control:

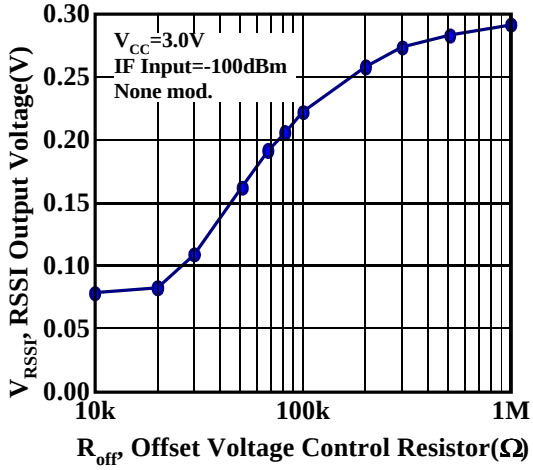
$$Gain = \frac{R_{S1} + R_{S2}}{R_{S1}}$$

The input of the buffer amplifier is limited: the low level is about 0.1V or more, the high level is less than V_{CC}-0.7V. For full range regular operation, make the output voltage @ Gain=1 in that range.
With programmable gain, the Rail-to-Rail output achieves wide dynamic range.

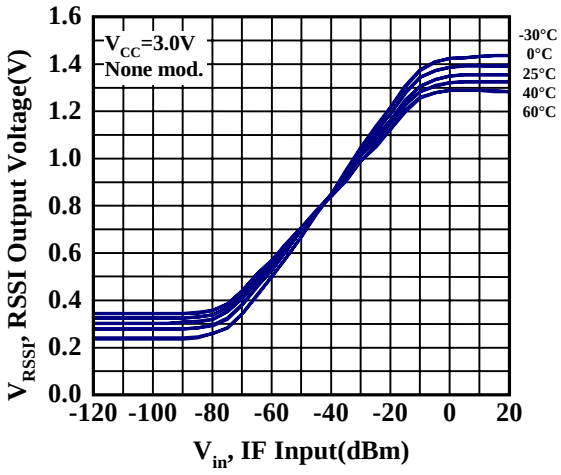
■ RSSI Output Voltage versus IF Input (Variable: Supply Voltage)



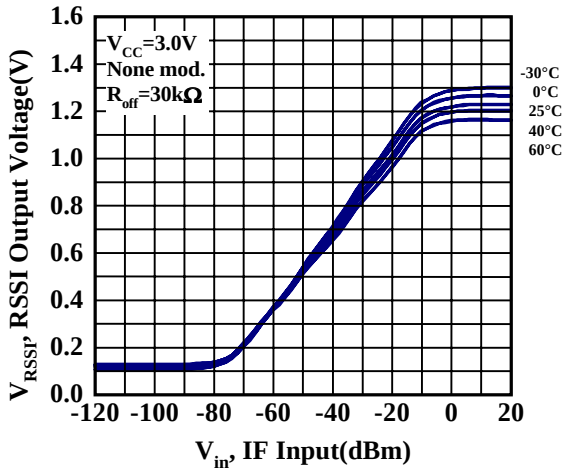
■ RSSI Offset Voltage versus Offset Voltage Control Resistor



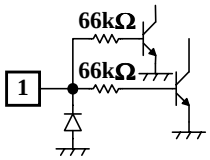
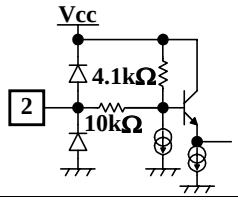
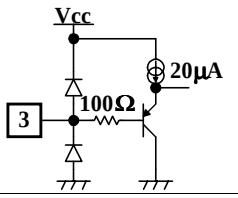
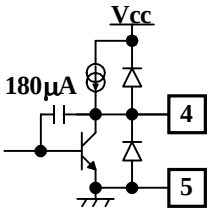
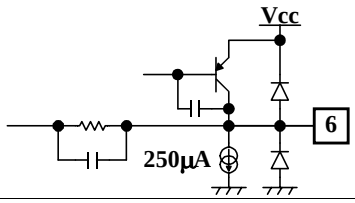
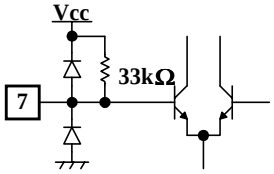
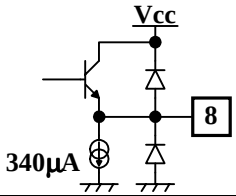
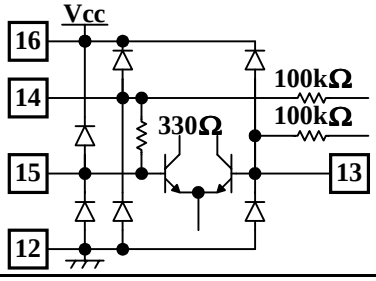
■ RSSI Output Voltage versus IF Input (Variable: T_a)
(Pin 2: Open)



■ RSSI Output Voltage versus IF Input (Variable: T_a)
(Offset Resistor 30kΩ is connected between Pin 2 and V_{CC})



10. PIN DESCRIPTION

Pin No.	Pin Description	Internal Equivalent Circuit	Description
1	POWER SAVE		Power save pin. The operation of this pin is described below: 1.5V or more: Operating mode. Less than 0.2V: Power save mode (stand-by)
2	RSSI OFFSET		RSSI offset control pin. A resistor, connected between this pin and V_{CC}, can reduce the offset voltage.
3	BUFFER IN -		RSSI buffer amplifier inverting input pin for feedback. Input Terminal for feedback of the RSSI buffer amplifier. By connecting this pin to pin 4, this block operates as a buffer amplifier (Gain=1).
4	RSSI OUTPUT		RSSI buffer amplifier output pin. The RSSI output voltage is obtained from this pin.
5	GND		Ground (Input side).
6	AF OUTPUT		AF output pin.
7	QUAD COIL		Detector input pin. Connection to the phase shifter.
8	IF OUTPUT		IF limiter amplifier output pin.
9~11	NC		No connection pin. / This pin is not wired.
12	GND		Ground (Output side).
13	DECOUP.		IF limiter amplifier decoupling pin.
14	DECOUP.		IF limiter amplifier decoupling pin.
15	IF INPUT		IF limiter amplifier input pin.
16	V_{CC}		Supply voltage pin.

11. NOTES

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- Power drive products for automobile, ship or aircraft transport systems; steering and navigation systems, emergency signal communications systems, and any system other than those mentioned above which include electronic sensors, measuring, or display devices, and which could cause major damage to life, limb or property if misused or failure to function.
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■ None of ozone depleting substances(ODS) under the Montreal Protocol is used in manufacturing process of us.

12. OFFICES

If you need more information on this product and other TOKO products, please contact us.

■ TOKO Inc. Headquarters
1-17, Higashi-yukigaya 2-chome, Ohta-ku, Tokyo,
145-8585, Japan
TEL: +81.3.3727.1161
FAX: +81.3.3727.1176 or +81.3.3727.1169
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