

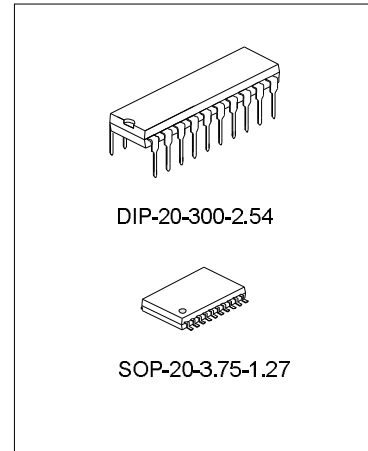
## INFRARED REMOTE CONTROL TRANSMITTER OF 9012 CODE FORMAT

### DESCRIPTION

SC9243 is an infrared remote control transmitter utilizing CMOS Technology specially designed for electrical appliances such as Audio System, Television, Video Cassette Recorder, CD Player and others. SC9243 is capable of multiple keying; thus, a maximum of 144 instructions is possible. The pin assignments and application circuit are optimized for easy PCB Layout and cost saving advantage.

### FEATURES

- \* CMOS Technology, Low Power Consumption
- \* Least External Components
- \* Up To 144 Instructions (32 Basic + 112 Multiple Keys)
- \* Multiple Keying Is Possible
- \* Wide Range Of Operating Supply Voltage: 2~4 Volts
- \* 7 Out Of 8 System Code Bits Are Pre-Settable
- \* Interference From Other Equipment Or Apparatus Is Prevented.



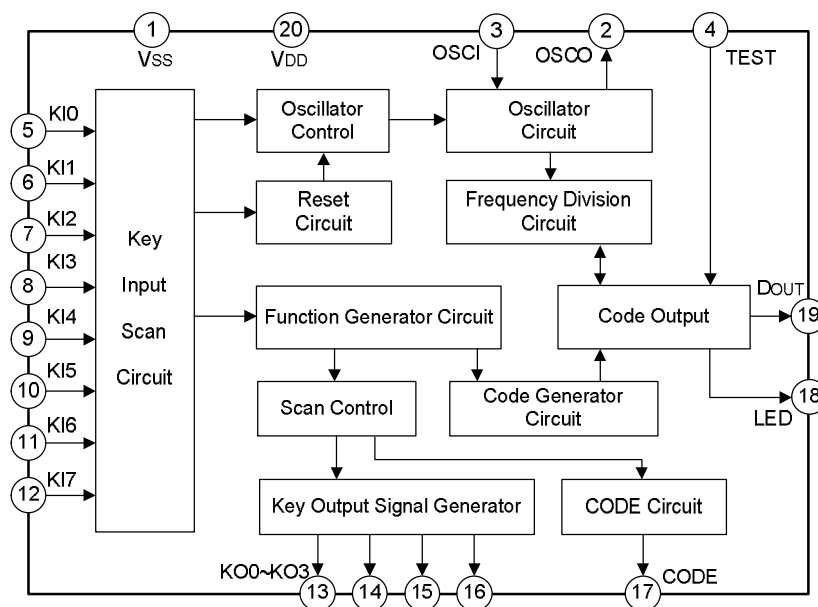
### ORDERING INFORMATION

Part No.	Package
SC9243	DIP-20-300-2.54
SC9243S	SOP-20-375-1.27

### APPLICATIONS

- \* Mini COMPO
- \* Video Cassette Recorder(VCR)
- \* CD-Player
- \* Audio Equipment

### BLOCK DIAGRAM



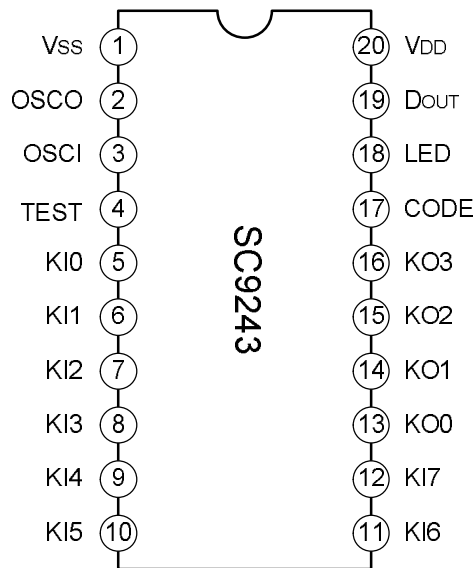
**ABSOLUTE MAXIMUM RATING** ( $T_{amb} \Rightarrow 25^{\circ}\text{C}$ )

Characteristics	Symbol	Test conditions	Ratings	Unit
Supply Voltage	V <sub>DD</sub>		-0.3 ~ 5.0	V
Input Voltage With Respect To V <sub>SS</sub>	V <sub>IN</sub>	V <sub>DD</sub> =3 V All outputs floating	V <sub>SS</sub> -0.3 ~ V <sub>DD</sub> +0.3	V
Power Dissipation	P <sub>d</sub>		300	mW
Storage Temperature	T <sub>stg</sub>		-40~125	°C
Operating Temperature	T <sub>opr</sub>	V <sub>DD</sub> =3 V	-20~70	°C

**ELECTRICAL CHARACTERISTICS** ( $T_{amb}=25^{\circ}\text{C}$ , V<sub>DD</sub>=3V)

Characteristics	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Operating supply Voltage	V <sub>DD</sub>	All Function Operating	2.0	3.0	4.0	V
Operating Supply Current	I <sub>DD</sub>	Key On Without Load f <sub>osc</sub> =455 kHz			1000	μA
Stand-By Current	I <sub>SB</sub>	All Keys Off Stops Oscillation Output Floating.			1	μA
Input Leakage Current(KI0~KI7)	I <sub>IL</sub>	V <sub>IN</sub> =GND			1.0	μA
Dout Driving Current	I <sub>OH</sub>	V <sub>DD</sub> =3V V <sub>O</sub> =1.5V	10			mA
LED Sinking Current	I <sub>OL</sub>	V <sub>DD</sub> =3V V <sub>O</sub> =1.5V	-5			mA
Input High Level Voltage	V <sub>IH</sub>		0.7 V <sub>DD</sub>		V <sub>DD</sub>	V
Input Low Level Voltage	V <sub>IL</sub>		0		0.3 V <sub>DD</sub>	V
Oscillation Frequency	f <sub>osc</sub>		400	455	800	kHz
Pull-down Resistor	R <sub>d</sub>	KI0~KI7 Pins	100	200	400	kΩ
Pull-up Resistor	R <sub>up</sub>	Test Pin	25	50	100	kΩ

**PIN CONFIGURATION**



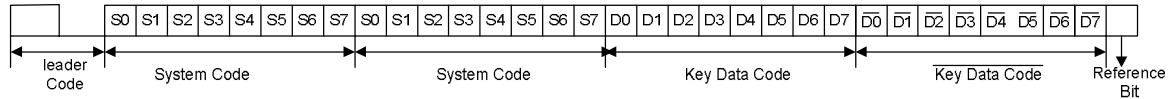
**PIN DESCRIPTION**

Pin No.	Symbol	Description
1	Vss	Negative Power Supply
2	OSCO	Oscillator Output Pin with Built-in Amplifier Circuit and Feedback Resistor
3	OSCI	Oscillator Input Pin with Built-in Amplifier Circuit and Feedback Resistor
4	TEST	Test Pin with Built-in Pull-up Resistor. Typical value is 50k Ohms. When Test Pin is connected to the VSS, Test Mode is activated. DOUT Pin output waveform shrinks 15 times without 38KHz carrier waveform
5~12	KI0~KI7	Key Matrix Input Pins. Each pin has a built-in pull-down resistor(200k Ohms)
13~16	KO0~KO3	Key Scan Output Pins. Normal Operation at "L" level when there is no Key Input.
17	CODE	Code Scan Output Pin. This Pin is an open drain type and used for system code setting.
18	LED	Transmission Display Output Pin
19	DOUT	Infrared LED Driving Output Pin
20	VDD	Positive Power Supply

## FUNCTIONAL DESCRIPTION

### 1. TRANSMISSION CODE

The transmission code consists of a leader code, 16 bits system code, and 8 bits data code. The inverse of the data code is also sent simultaneously. The following diagram shows this one frame construction.



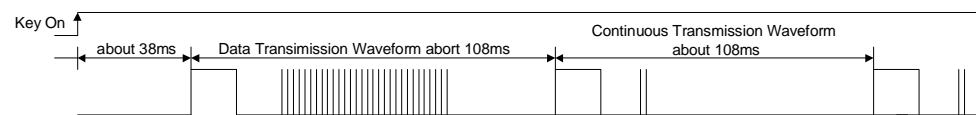
It should be noted that System Code Bit 7(S7) has a fixed value of "1".

The leader code consists of a 4.5 ms carrier waveform followed by a 4.5 ms OFF waveform. It is used as the leader for the following codes. Thus, when reception is configured by a microcomputer, the time relationship between the detection of the reception and the other processes can be managed efficiently. The code uses the PPM (Pulse Position Modulation) Method, with "0" and "1" differentiated by the time between pulses.

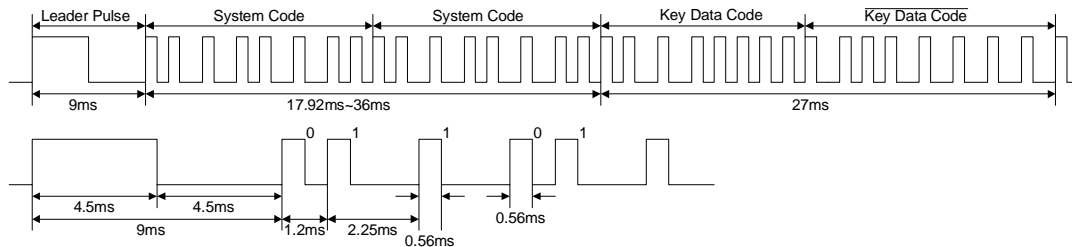
### 2. REMOTE OUTPUT WAVEFORMS

SC9243 Remote Output Waveforms are given in the diagram below.(for  $f_{osc}=455\text{KHz}$ )

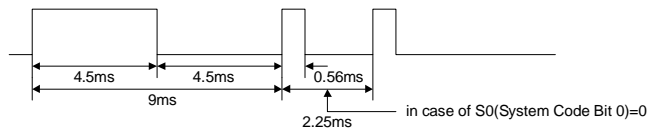
#### DOUT Output Waveform



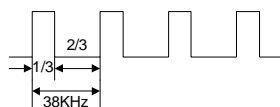
#### Data Transmission Waveform



#### Continuous Transmission Waveform



#### Carrier Waveform



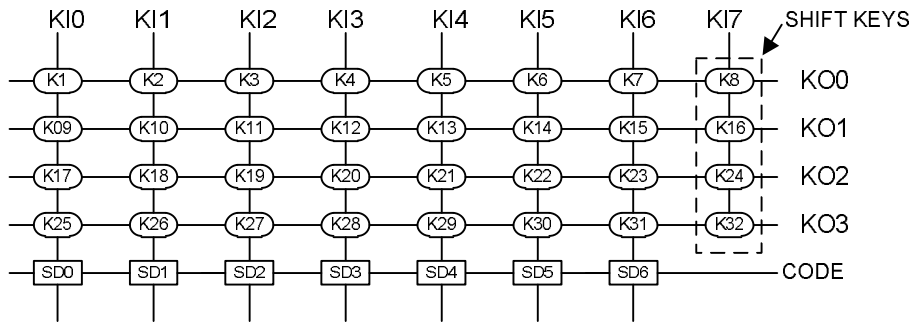
When oscillation frequency is 455 KHz, a signal is outputted after pulse is modulated by 38 KHz of duty 1/3 (which is 1/12 of the carrier generation circuit).

**Note:** In preparing the firmware of the receiving circuit, please strictly follow the following instructions:

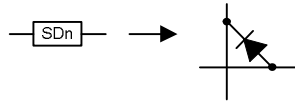
1. System Codes: The same code is transmitted twice and therefore, always decode these 2 codes and check if they are in agreement with each other.
2. Key Data Codes: The Key Data Code and its inversed code are always transmitted together, therefore, check if they are in agreement with each other.

### 3. KEY MATRIX

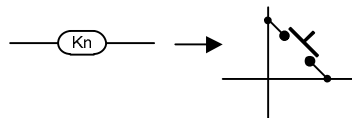
SC9243 enables the maximum setting of up to 32 keys through a combination of KI0 to KI7 and KO0~KO3. Furthermore, the System Codes are settable in 7 bits through the combination of KI0~KI6 and Code Key. Please refer to the diagram below:



Note:  
System Code Diode Jumper



Key Switch

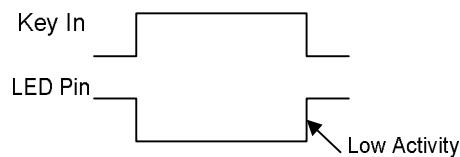


Key Nos.K8,16,24 and 32 (the Shift Keys ) can be pressed simultaneously or in any random order with other keys (normal keys).

The system code setting is constructed by connecting the diode jumper between Code Key and KI0~KI6 keys. With the diode jumper, the system code will have the value of "1". If Code and any one of the KI0~KI6 keys are connected only at one point, the diode jumper may be disregarded.

### 4.LED TERMINAL

When there is no key activity, the LED Pin is in the HIGH Level. Please refer to the diagram below.



**SC9243 DATA CODE MAP 1 (ONE KEY PRESSED)**

Key No.	KO Port	KI Port	D0	D1	D2	D3	D4	D5	D6	D7
K1	KO0	KI0	1	0	0	0	0	0	0	0
K2		KI1	0	1	0	0	0	0	0	0
K3		KI2	1	1	0	0	0	0	0	0
K4		KI3	0	0	1	0	0	0	0	0
K5		KI4	1	0	1	0	0	0	0	0
K6		KI5	0	1	1	0	0	0	0	0
K7		KI6	1	1	1	0	0	0	0	0
K8		KI7	0	0	0	0	0	0	1	0
K9	KO1	KI0	1	0	0	1	0	0	0	0
K10		KI1	0	1	0	1	0	0	0	0
K11		KI2	1	1	0	1	0	0	0	0
K12		KI3	0	0	1	1	0	0	0	0
K13		KI4	1	0	1	1	0	0	0	0
K14		KI5	0	1	1	1	0	0	0	0
K15		KI6	1	1	1	1	0	0	0	0
K16		KI7	0	0	0	0	0	0	1	1
K17	KO2	KI0	1	0	0	0	1	0	0	0
K18		KI1	0	1	0	0	1	0	0	0
K19		KI2	1	1	0	0	1	0	0	0
K20		KI3	0	0	1	0	1	0	0	0
K21		KI4	1	0	1	0	1	0	0	0
K22		KI5	0	1	1	0	1	0	0	0
K23		KI6	1	1	1	0	1	0	0	0
K24		KI7	0	0	0	0	0	0	1	0
K25	KO3	KI0	1	0	0	1	1	0	0	0
K26		KI1	0	1	0	1	1	0	0	0
K27		KI2	1	1	0	1	1	0	0	0
K28		KI3	0	0	1	1	1	0	0	0
K29		KI4	1	0	1	1	1	0	0	0
K30		KI5	0	1	1	1	1	0	0	0
K31		KI6	1	1	1	1	1	0	0	0
K32		KI7	0	0	0	0	0	0	1	1

**SC9243 DATA CODE MAP 2 (WHEN SHIFT KEY K8 + OTHER KEYS ARE PRESSED)**

Key No.	KO Port	KI Port	D0	D1	D2	D3	D4	D5	D6	D7
K1	KO0	KI0	1	0	0	0	0	1	0	0
K2		KI1	0	1	0	0	0	1	0	0
K3		KI2	1	1	0	0	0	1	0	0
K4		KI3	0	0	1	0	0	1	0	0
K5		KI4	1	0	1	0	0	1	0	0
K6		KI5	0	1	1	0	0	1	0	0
K7		KI6	1	1	1	0	0	1	0	0
K8		KI7								
K9	KO1	KI0	1	0	0	1	0	1	0	0
K10		KI1	0	1	0	1	0	1	0	0
K11		KI2	1	1	0	1	0	1	0	0
K12		KI3	0	0	1	1	0	1	0	0
K13		KI4	1	0	1	1	0	1	0	0
K14		KI5	0	1	1	1	0	1	0	0
K15		KI6	1	1	1	1	0	1	0	0
K16		KI7								
K17	KO2	KI0	1	0	0	0	1	1	0	0
K18		KI1	0	1	0	0	1	1	0	0
K19		KI2	1	1	0	0	1	1	0	0
K20		KI3	0	0	1	0	1	1	0	0
K21		KI4	1	0	1	0	1	1	0	0
K22		KI5	0	1	1	0	1	1	0	0
K23		KI6	1	1	1	0	1	1	0	0
K24		KI7								
K25	KO3	KI0	1	0	0	1	1	1	0	0
K26		KI1	0	1	0	1	1	1	0	0
K27		KI2	1	1	0	1	1	1	0	0
K28		KI3	0	0	1	1	1	1	0	0
K29		KI4	1	0	1	1	1	1	0	0
K30		KI5	0	1	1	1	1	1	0	0
K31		KI6	1	1	1	1	1	1	0	0
K32		KI7								

**SC9243 DATA CODE MAP 3 (WHEN SHIFT KEY K16+OTHER KEYS ARE PRESSED)**

Key No.	KO Port	KI Port	D0	D1	D2	D3	D4	D5	D6	D7
K1	KO0	KI0	1	0	0	0	0	1	1	0
K2		KI1	0	1	0	0	0	1	1	0
K3		KI2	1	1	0	0	0	1	1	0
K4		KI3	0	0	1	0	0	1	1	0
K5		KI4	1	0	1	0	0	1	1	0
K6		KI5	0	1	1	0	0	1	1	0
K7		KI6	1	1	1	0	0	1	1	0
K8		KI7								
K9	KO1	KI0	1	0	0	1	0	1	1	0
K10		KI1	0	1	0	1	0	1	1	0
K11		KI2	1	1	0	1	0	1	1	0
K12		KI3	0	0	1	1	0	1	1	0
K13		KI4	1	0	1	1	0	1	1	0
K14		KI5	0	1	1	1	0	1	1	0
K15		KI6	1	1	1	1	0	1	1	0
K16		KI7								
K17	KO2	KI0	1	0	0	0	1	1	1	0
K18		KI1	0	1	0	0	1	1	1	0
K19		KI2	1	1	0	0	1	1	1	0
K20		KI3	0	0	1	0	1	1	1	0
K21		KI4	1	0	1	0	1	1	1	0
K22		KI5	0	1	1	0	1	1	1	0
K23		KI6	1	1	1	0	1	1	1	0
K24		KI7								
K25	KO3	KI0	1	0	0	1	1	1	1	0
K26		KI1	0	1	0	1	1	1	1	0
K27		KI2	1	1	0	1	1	1	1	0
K28		KI3	0	0	1	1	1	1	1	0
K29		KI4	1	0	1	1	1	1	1	0
K30		KI5	0	1	1	1	1	1	1	0
K31		KI6	1	1	1	1	1	1	1	0
K32		KI7								



**SC9243 DATA CODE MAP 4 (WHEN SHIFT KEY K24+OTHER KEYS ARE PRESSED)**

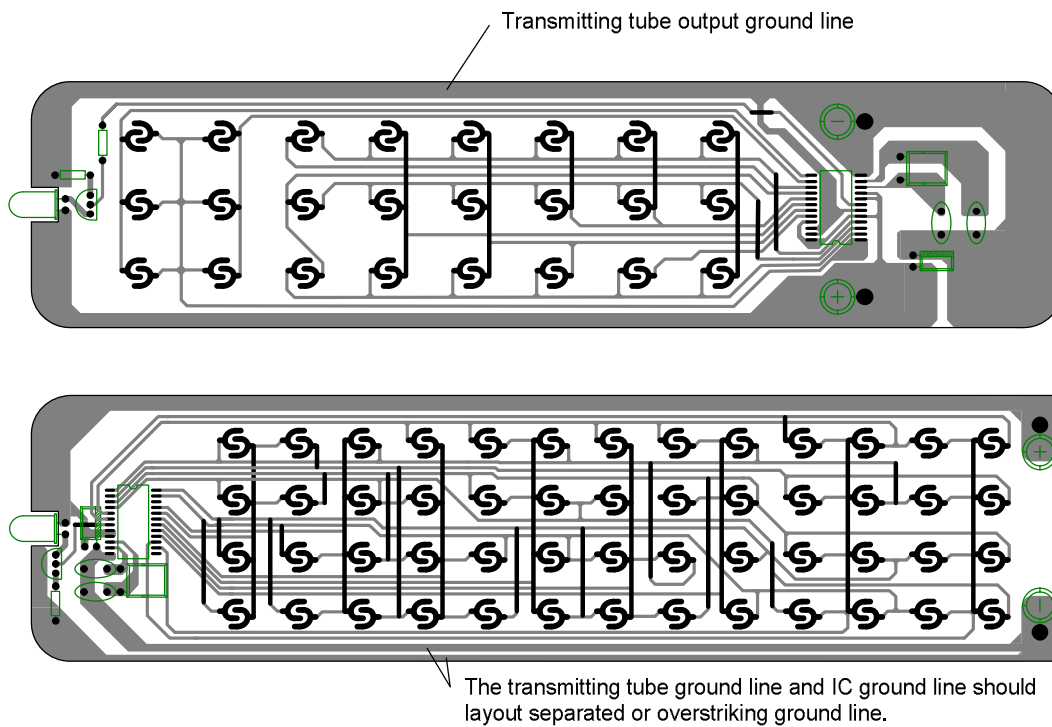
Key No.	KO Port	KI Port	D0	D1	D2	D3	D4	D5	D6	D7
K1	KO0	KI0	1	0	0	0	0	1	0	1
K2		KI1	0	1	0	0	0	1	0	1
K3		KI2	1	1	0	0	0	1	0	1
K4		KI3	0	0	1	0	0	1	0	1
K5		KI4	1	0	1	0	0	1	0	1
K6		KI5	0	1	1	0	0	1	0	1
K7		KI6	1	1	1	0	0	1	0	1
K8		KI7								
K9	KO1	KI0	1	0	0	1	0	1	0	1
K10		KI1	0	1	0	1	0	1	0	1
K11		KI2	1	1	0	1	0	1	0	1
K12		KI3	0	0	1	1	0	1	0	1
K13		KI4	1	0	1	1	0	1	0	1
K14		KI5	0	1	1	1	0	1	0	1
K15		KI6	1	1	1	1	0	1	0	1
K16		KI7								
K17	KO2	KI0	1	0	0	0	1	1	0	1
K18		KI1	0	1	0	0	1	1	0	1
K19		KI2	1	1	0	0	1	1	0	1
K20		KI3	0	0	1	0	1	1	0	1
K21		KI4	1	0	1	0	1	1	0	1
K22		KI5	0	1	1	0	1	1	0	1
K23		KI6	1	1	1	0	1	1	0	1
K24		KI7								
K25	KO3	KI0	1	0	0	1	1	1	0	1
K26		KI1	0	1	0	1	1	1	0	1
K27		KI2	1	1	0	1	1	1	0	1
K28		KI3	0	0	1	1	1	1	0	1
K29		KI4	1	0	1	1	1	1	0	1
K30		KI5	0	1	1	1	1	1	0	1
K31		KI6	1	1	1	1	1	1	0	1
K32		KI7								

**SC9243 DATA CODE MAP 5 (WHEN SHIFT KEY K32+OTHER KEYS ARE PRESSED)**

Key No.	KO Port	KI Port	D0	D1	D2	D3	D4	D5	D6	D7
K1	KO0	KI0	1	0	0	0	0	1	1	1
K2		KI1	0	1	0	0	0	1	1	1
K3		KI2	1	1	0	0	0	1	1	1
K4		KI3	0	0	1	0	0	1	1	1
K5		KI4	1	0	1	0	0	1	1	1
K6		KI5	0	1	1	0	0	1	1	1
K7		KI6	1	1	1	0	0	1	1	1
K8		KI7								
K9	KO1	KI0	1	0	0	1	0	1	1	1
K10		KI1	0	1	0	1	0	1	1	1
K11		KI2	1	1	0	1	0	1	1	1
K12		KI3	0	0	1	1	0	1	1	1
K13		KI4	1	0	1	1	0	1	1	1
K14		KI5	0	1	1	1	0	1	1	1
K15		KI6	1	1	1	1	0	1	1	1
K16		KI7								
K17	KO2	KI0	1	0	0	0	1	1	1	1
K18		KI1	0	1	0	0	1	1	1	1
K19		KI2	1	1	0	0	1	1	1	1
K20		KI3	0	0	1	0	1	1	1	1
K21		KI4	1	0	1	0	1	1	1	1
K22		KI5	0	1	1	0	1	1	1	1
K23		KI6	1	1	1	0	1	1	1	1
K24		KI7								
K25	KO3	KI0	1	0	0	1	1	1	1	1
K26		KI1	0	1	0	1	1	1	1	1
K27		KI2	1	1	0	1	1	1	1	1
K28		KI3	0	0	1	1	1	1	1	1
K29		KI4	1	0	1	1	1	1	1	1
K30		KI5	0	1	1	1	1	1	1	1
K31		KI6	1	1	1	1	1	1	1	1
K32		KI7								



PCB WIRE LAYOUT SCHEMATIC



The above IC only use to hint, not to specified.

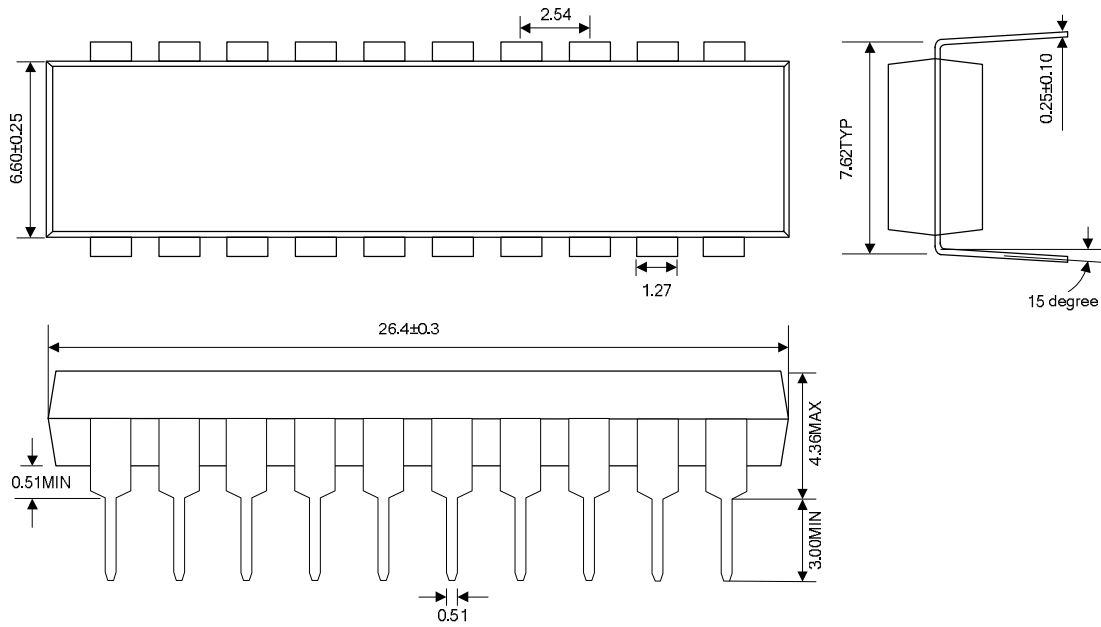
**Note:**

- \* In wire layout, the power filter capacitor should near to IC.
- \* In wire layout, should avoid power line and ground line too long.
- \* Recommended infrared transmit unit and IC ground line should layout separated, or overstriking lines.
- \* The emitter of triode connect 1  $\Omega$  resistor at least.

PACKAGE OUTLINE

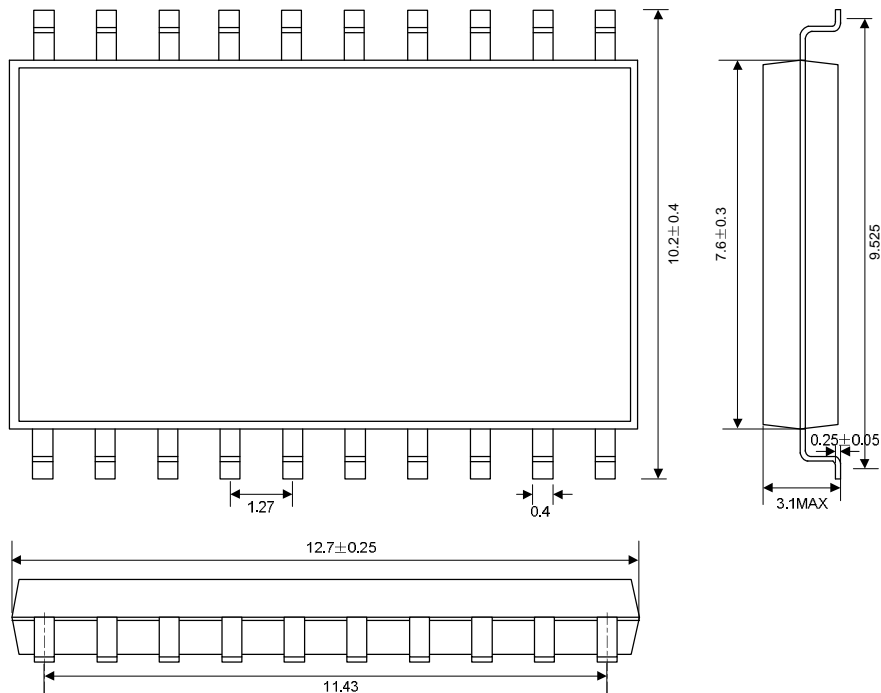
DIP-20-300-2.54

UNIT: mm



SOP-20-375-1.27

UNIT: mm





#### HANDLING MOS DEVICES:

Electrostatic charges can exist in many things. All of our MOS devices are internally protected against electrostatic discharge but they can be damaged if the following precautions are not taken:

- Persons at a work bench should be earthed via a wrist strap.
- Equipment cases should be earthed.
- All tools used during assembly, including soldering tools and solder baths, must be earthed.
- MOS devices should be packed for dispatch in antistatic/conductive containers.

**Note:** IC oscillator input mustn't be on the outside layer, thus to avoid the abnormal working when human body touches the remote controller without crust in testing.

## ATTACHMENT

## Revision History

Data	REV	Description	Page
2000.12.31	1.0	Original	
2002.02.28	1.1	Modify the "Absolute maximum rating"	2
		Modify the "Typical application circuit"	11
		Add the "PCB wire layout schematic"	12
		Modify the "Package outline"	13