

TC9259N

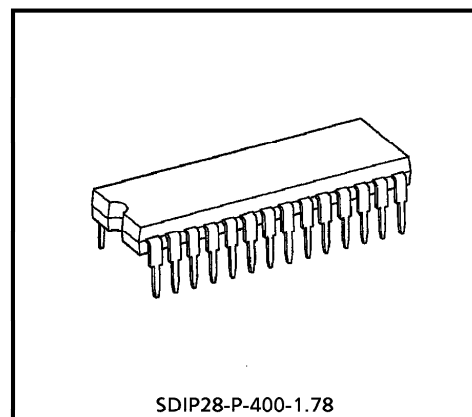
INFRARED REMOTE CONTROL RECEIVING LSI

TC9259N is an LSI for infrared remote control receiving. It is used for remote control of devices such as audio systems, TVs, VCRs, and CD players.

Remote control systems are easily constructed using TC9259N in combination with transmitting LSIs TC9243P and TC9243F.

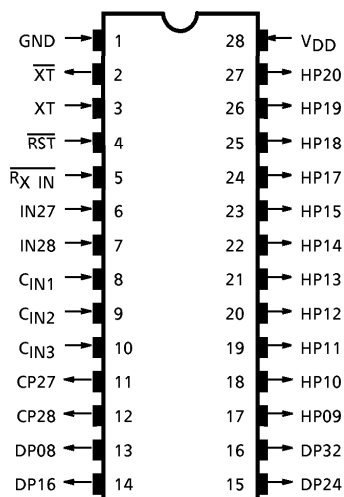
FEATURES

- Basic functions : 17
 - Hold pulse functions : 15
 - Cyclic pulse functions : 2
- 4 functions out of 15 hold pulse functions are shift key outputs and can be output in parallel with other outputs corresponding to double-pushed signals sent from sending side.
- The 2 cyclic pulse functions can be control outputs using an external key in addition to control by remote control signal.
- 8bit system codes are detected. System codes permitting signal receiving can be set up to 3 bits. Interference with other equipment can be thus prevented.



SDIP28-P-400-1.78
Weight : 2.2g (Typ.)

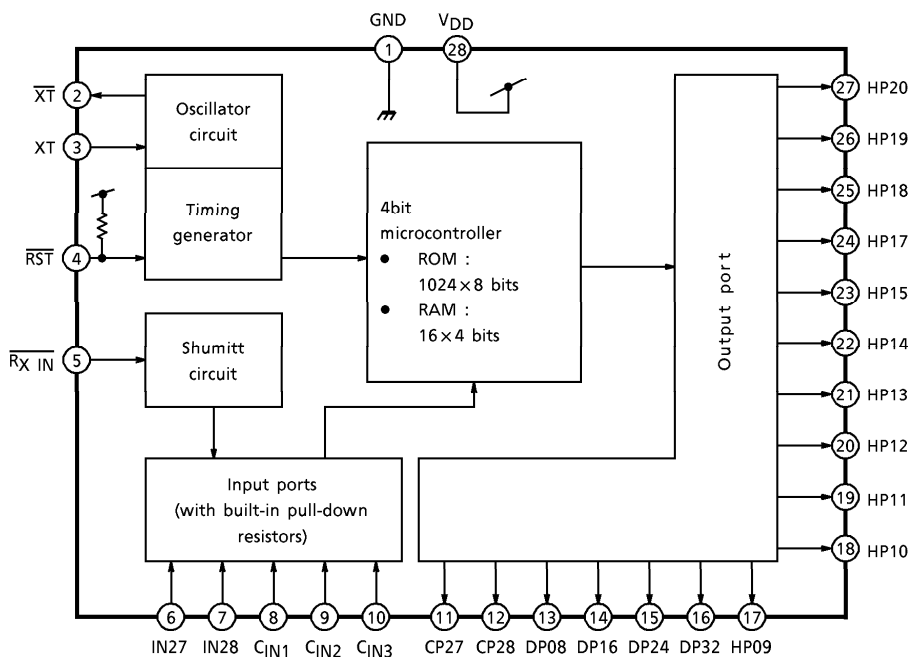
PIN CONNECTION (TOP VIEW)



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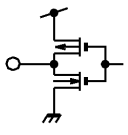
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BLOCK DIAGRAM



PIN FUNCTION

PIN No.	SYMBOL	PIN NAME	FUNCTION AND OPERATION
1	GND	Power supply pins	Applies power supply voltage. (V _{DD} = 5V, Typ.)
28	V _{DD}		
2	XT	Oscillator pins	Ceramic oscillator output and input. Amp circuit and feedback resistor are built in.
3	XT		
4	RST	Reset input	When set to "L" level, initializes internal states. Pull-up resist or is built in.
5	RX IN	Remote control signal input	Inputs remote control signal whose sub-carrier signal is removed.
6, 7	IN27, 28	Cyclic input	Inverts corresponding output (CP27 and CP28) each time "H" level is input. Pull-down resistors are built in.
8~10	CIN1~3	Code input	Inputs system code which enables receiving. Pull-down resistors are built in.

PIN No.	SYMBOL	PIN NAME	FUNCTION AND OPERATION	
11, 12	CP27, 28	Cyclic output	Inverted by corresponding remote control signal and key input. Low level when power is turned ON (RESET).	OUTPUT FORMAT 
13~16 17~23 24~27	DP08, 16, 24, 32 HP09~15 HP17~20	Hold pulse	Remains at "H" level during remote control signal input. DP08, DP16, DP24 and DP32 are used for outputting shift pulses in parallel with other output.	

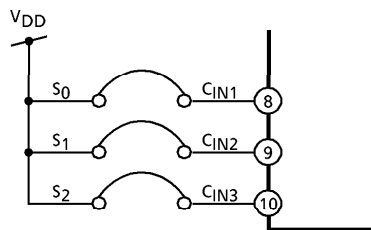
OPERATIONS

1. Setting receive-enable system code

Transmitting LSIs TC9243P and TC9243F support an 8bit system code transmitting format to prevent interference with other machines. This code makes each machine unique and thus prevents interference.

With TC9259N, the lower 3 bits of the 8bit system code used to enable receive can be set. The upper 5 bits are fixed to "1000 0". (Setting value range : "80"~"87" HEX.)

Once this receive-enabling system code is set, a match between the system code of the remote control input signal and the set system code enables reception of the subsequent key data code.



To set the receive-enabling system code, connect pins CIN1~3 to VDD using jumpers. The jumpers correspond to system code bits 0~2 (S0~S2). Connecting the pins to VDD using jumpers sets the corresponding bits to "1".

2. Receive signal check

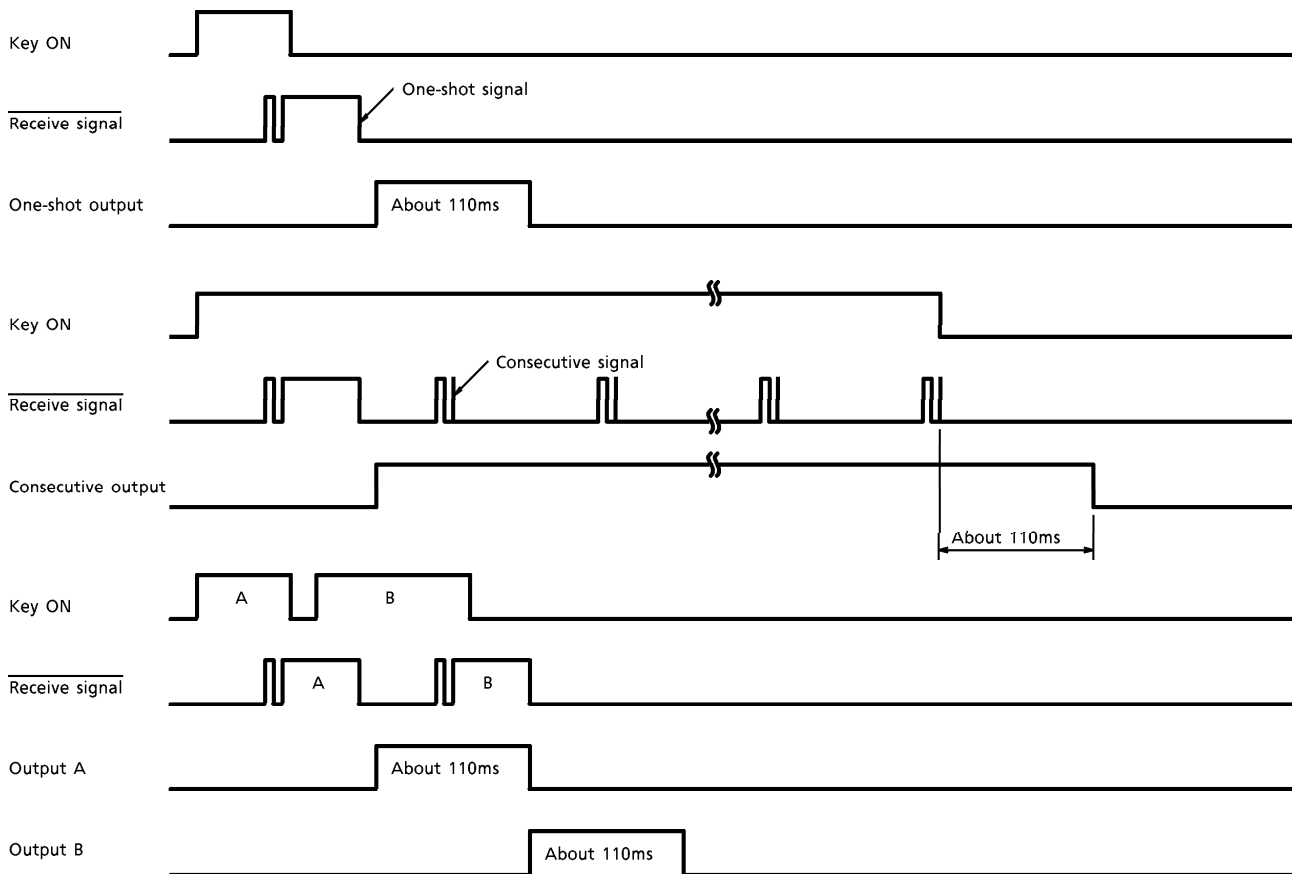
The transmitting LSIs TC9243P and TC9243F support transmission of a check code in one-shot waveforms in order to prevent malfunctioning due to data read errors. As the check code, the same system code is sent again; after the key data code, the inverted key data code is sent.

Leader pulse	System code								System code								Key data code								Key data code							
	S ₀	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₀	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	D ₀	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇	$\overline{D_0}$	$\overline{D_1}$	$\overline{D_2}$	$\overline{D_3}$	$\overline{D_4}$	$\overline{D_5}$	$\overline{D_6}$	$\overline{D_7}$

TC9259N decodes all data. The code is sent twice. TC9259N determines that the data are valid only when codes in both transmissions match.

3. CP, DP and HP output pulses

3-1. DP08, DP16, DP24, DP32, HP09~15 and HP17~20 (Hold pulses)



When the initial one-shot system code and the receive signal are checked and the data are valid, the hold pulse is switched to "H" level.

If the receive signal is only a one-shot signal, the output switches to "L" level after about 110ms.

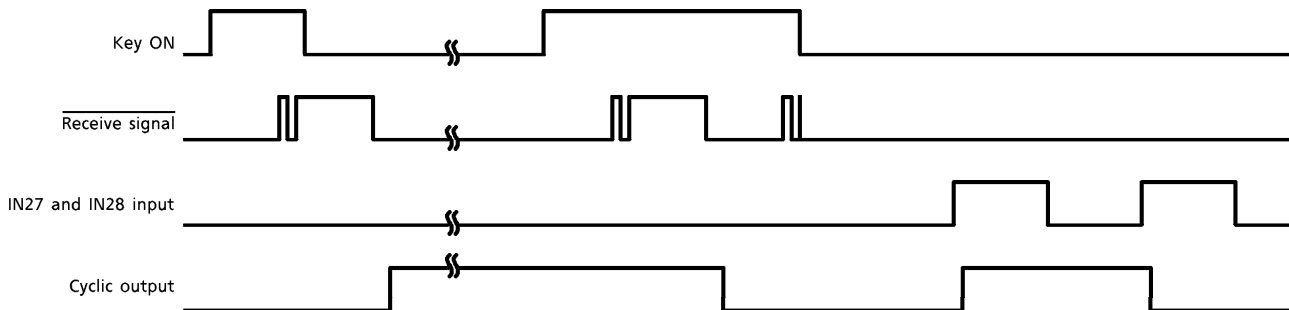
If the key is held down after the one-shot signal is output and signals are input consecutively, the output stays at "H" level.

When the key is released and the consecutive signal input stops, key release is determined after 110ms elapses after the last consecutive signal input. The output is switched to "L" level.

DP08, DP16, DP24 and DP32 are used for outputting shift pulses. These are set to "H" level in parallel to other output in response to a signal indicating that two keys are pressed simultaneously sent by the transmitter.

This type of output is optimal for tape deck RECORD-PLAY, RECORD-PAUSE and RECORD-REVERSE output.

3-2. CP27 and CP28 (Cyclic pulses)



Cyclic pulses are inverted each time a one-shot signal is received.
 Setting pin IN27 to "H" level also inverts CP27 ; pin IN28, also inverts CP28.
 Unless output is stabilized within 4ms, cyclic pulse is not valid. Thus, an external component used to prevent chatter is not required.
 Cyclic pulse output is optimal for turning power ON/OFF and for MUTE.

4. Code assignment (Key numbers : TC9243P and TC9243F send key numbers)

KEY NUMBER	KEY DATA CODE								OUTPUT	FUNCTION
	D ₀	D ₁	D ₂	D ₃	D ₄	D ₅	D ₆	D ₇		
K09	1	0	0	1	0	(*)	(*)	(*)	HP09	Hold
K10	0	1	0	1	0	(*)	(*)	(*)	HP10	
K11	1	1	0	1	0	(*)	(*)	(*)	HP11	
K12	0	0	1	1	0	(*)	(*)	(*)	HP12	
K13	1	0	1	1	0	(*)	(*)	(*)	HP13	
K14	0	1	1	1	0	(*)	(*)	(*)	HP14	
K15	1	1	1	1	0	(*)	(*)	(*)	HP15	
K17	1	0	0	0	1	(*)	(*)	(*)	HP17	
K18	0	1	0	0	1	(*)	(*)	(*)	HP18	
K19	1	1	0	0	1	(*)	(*)	(*)	HP19	
K20	0	0	1	0	1	(*)	(*)	(*)	HP20	
K08	(*)	(*)	(*)	(*)	(*)	1	0	0	DP08	Hold and Shift
K16	(*)	(*)	(*)	(*)	(*)	1	1	0	DP16	
K24	(*)	(*)	(*)	(*)	(*)	1	0	1	DP24	
K32	(*)	(*)	(*)	(*)	(*)	1	1	1	DP32	
K27	1	1	0	1	1	(*)	(*)	(*)	CP27	Cyclic
K28	0	0	1	1	1	(*)	(*)	(*)	CP28	

(*) Don't care (Corresponding output changes regardless of data)

MAXIMUM RATING (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V _{DD}	- 0.3~6.0	V
Input Voltage	V _{IN}	GND - 0.3~V _{DD} + 0.3	V
Power Dissipation	P _D	350	mW
Operating Temperature	T _{opr}	- 40~85	°C
Storage Temperature	T _{stg}	- 65~150	°C

ELECTRICAL CHARACTERISTICS

Recommended operating conditions (Unless otherwise specified, V_{DD} = 5.0V, Ta = 25°C)

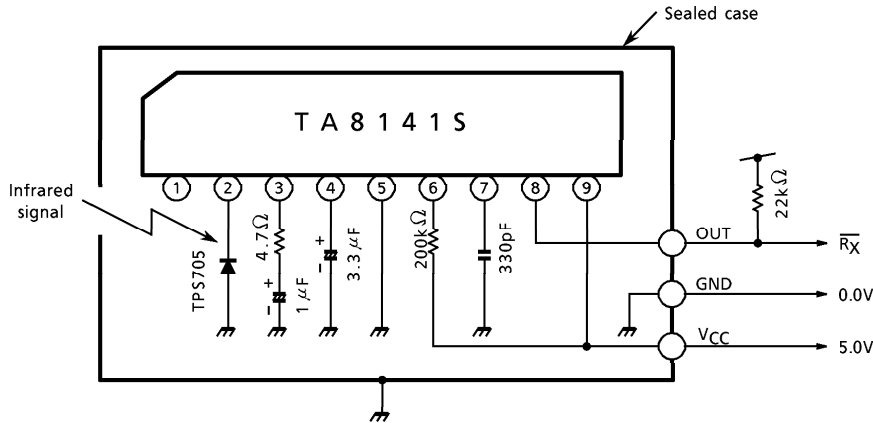
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Supply Voltage	V _{DD}	—	Ta = - 25~75°C	4.5	—	5.5	V
Oscillation Frequency	f _{osc}	—	—	400	—	800	kHz
Input Voltage	"H" Level	V _{IH1}	(Except \overline{RST} , $\overline{RX IN}$)	V _{DD} × 0.7	—	V _{DD}	V
	"H" Level	V _{IH2}	(\overline{RST} , $\overline{RX IN}$)	V _{DD} × 0.8	—	V _{DD}	V
	"L" Level	V _{IL1}	(Except \overline{RST} , $\overline{RX IN}$)	0	—	V _{DD} × 0.3	V
	"L" Level	V _{IL2}	(\overline{RST} , $\overline{RX IN}$)	0	—	V _{DD} × 0.2	V

DC Characteristics (Unless otherwise specified, V_{DD} = 5.0V, Ta = 25°C)

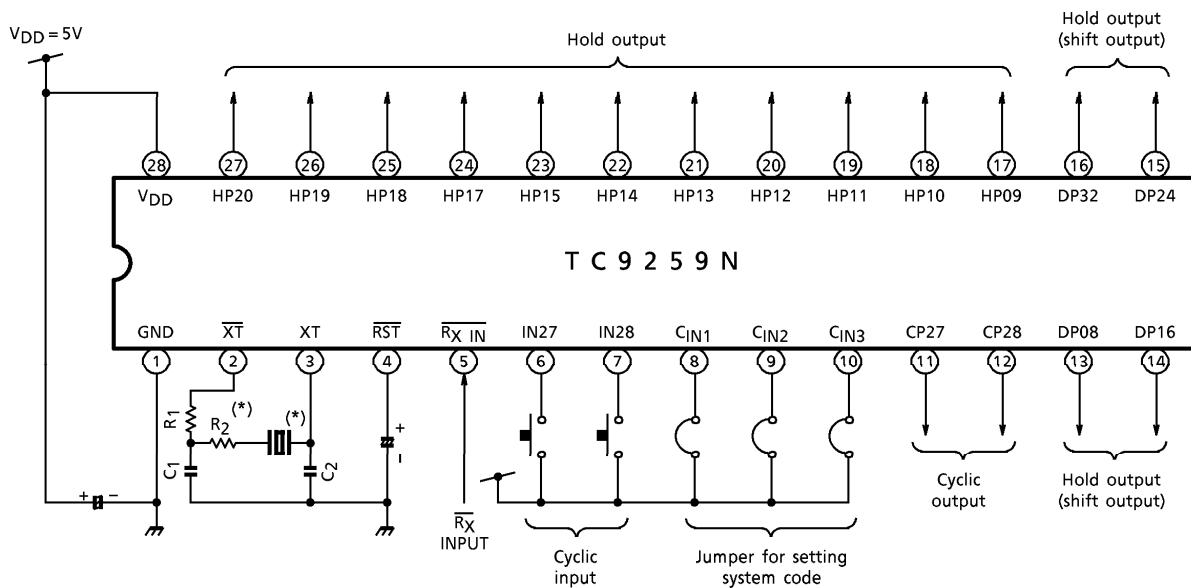
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating Supply Current	I _{DD}	—	f _{osc} = 455kHz	—	1.0	3.0	mA
Pull-down Resistor	R _D	—	(IN27, 28, C _{IN1~3})	100	200	400	kΩ
Pull-up Resistor	R _U	—	(\overline{RST})	25	50	100	kΩ
Output Current	"H" Level	I _{OH}	(CP, DP, HP) V _{OH} = 4V	- 1.0	- 4.0	—	mA
	"L" Level	I _{OL}	(CP, DP, HP) V _{OL} = 1V	1.0	8.0	—	mA
Input Leak Current	I _{LI}	—	V _{IN} = GND, V _{DD}	- 1.0	—	1.0	μA

APPLICATION CIRCUIT

1. Receiver circuit



2. TC9259N circuit



(*) Ceramic Oscillator

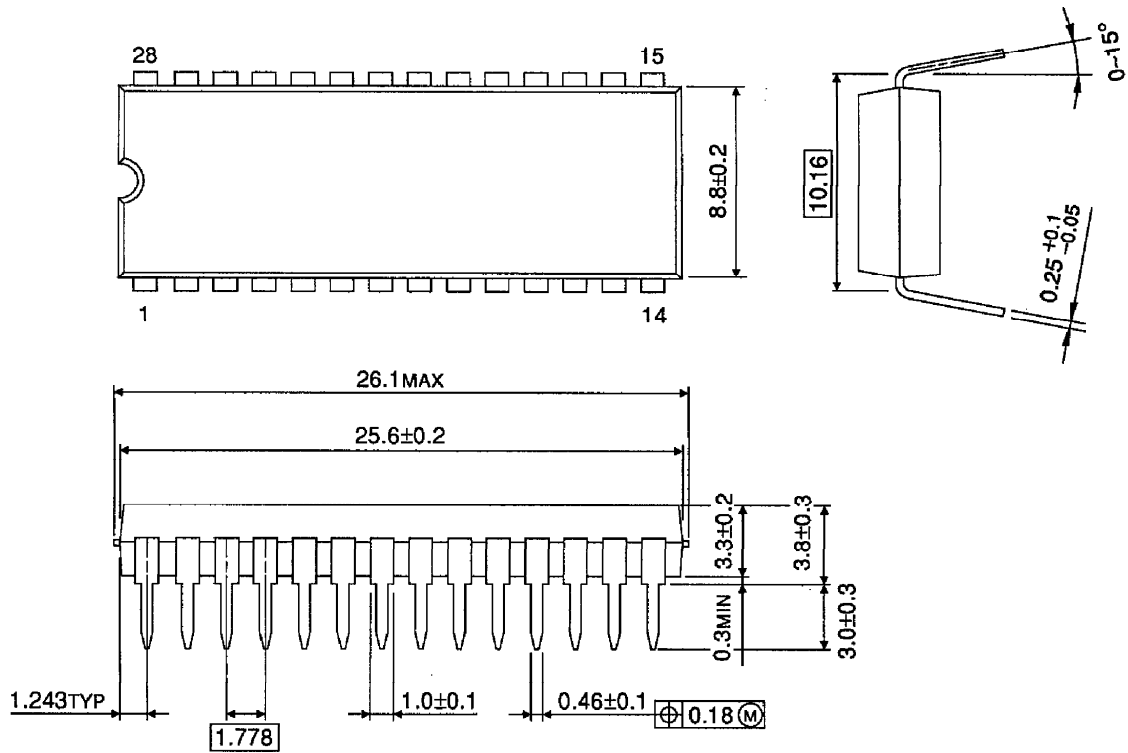
CSB455E (Murata Seisakusyo) $C_1 = C_2 = 100\text{pF}$, $R_1 = 10\text{k}\Omega$, $R_2 = 4.3\text{k}\Omega$

FCR455K3 (TDK) $C_1 = C_2 = 220\text{pF}$, $R_1 = 4.7\text{k}\Omega$, $R_2 = \text{unnecessary}$ (In case of influenced by oscillation noise, add resistor to large ($>4.7\text{k}\Omega$)) or equivalent.

(Note) System code can be set "80"~"87" HEX.

OUTLINE DRAWING
SDIP28-P-400-1.78

Unit : mm



Weight : 2.2g (Typ.)