

Infrared Remote Control Transmitter**PT2221/PT2222**

DESCRIPTION

The PT2221 and PT2222 are remote control transmitters utilizing CMOS Technology specially designed for use on infrared remote control applications. They are pin-to-pin compatible with NEC μ PD6121 and μ PD6122 respectively. PT2221 is packaged in 20 pins SO and capable of controlling 32 functions and 3 double keys. PT2222, on the other hand, is housed in 24 pins SO and capable of controlling 64 function keys and 3 double keys. PT2221/PT2222 may be paired with PT2225 to construct a powerful remote control system.

FEATURES

- CMOS Technology
- Low Power Consumption (VDD=2.0 to 5.5V)
- Pin-to-Pin Compatible with μ PD6121/ μ PD6122
- Using SEL pin, PT2221 can support 64+6 function codes
- Using SEL pin, PT2222 can support 128 + 6 function codes
- Customer Code can be selected (please contact PTC for details)
- Available in COB Package

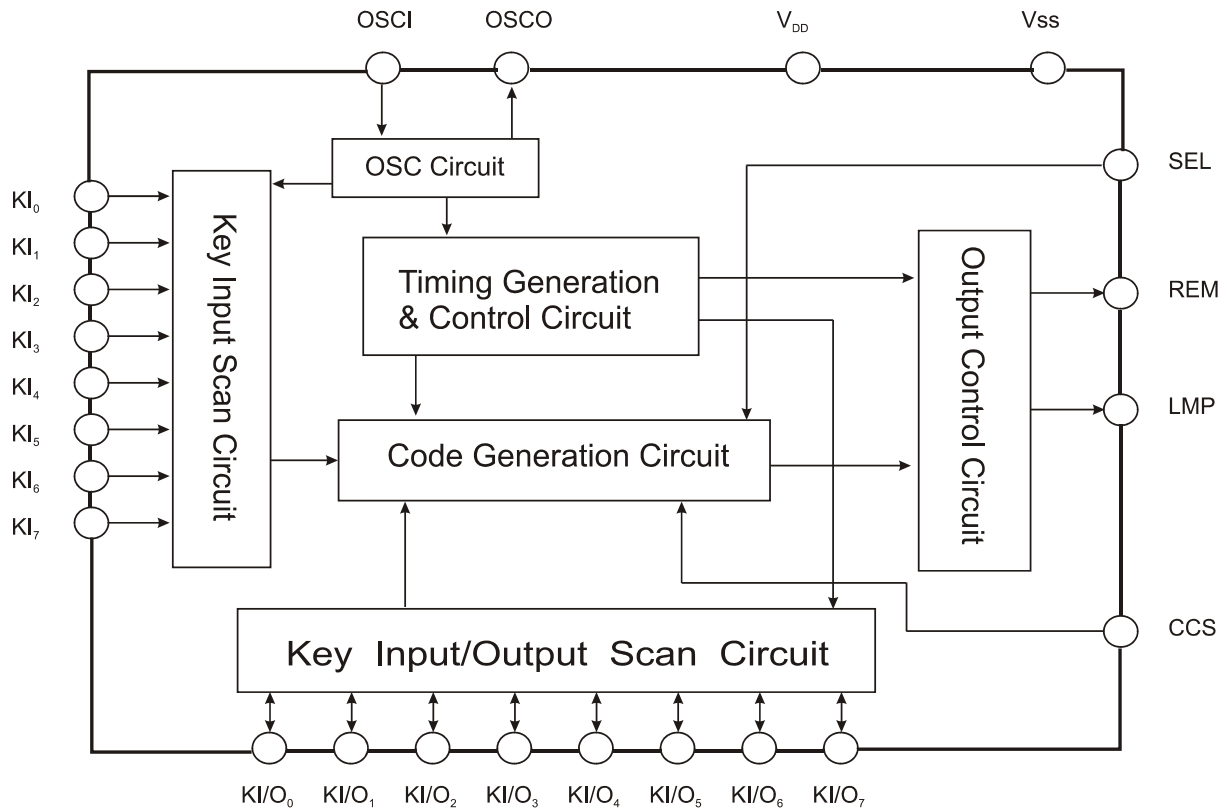
APPLICATIONS

- Audio Equipment
- Television (TV)
- Cable TV Tuner
- Video Cassette Recorder (VCR)
- Cassette Deck
- Air Conditioner
- Video Compact Disk (VCD)
- DVD ROM/Player
- Moniputer / Multi-Media Personal Computer System

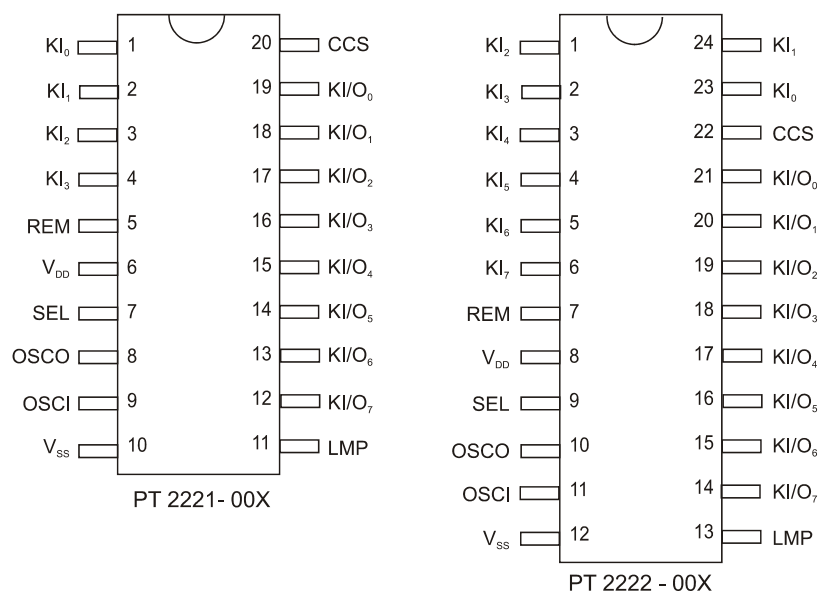
Infrared Remote Control Transmitter

PT2221/PT2222

BLOCK DIAGRAM



PIN CONFIGURATION



Infrared Remote Control Transmitter
PT2221/PT2222

PIN DESCRIPTION

Pin Name	I/O	Description	Pin Number	
			20 Pins	24 Pins
Vss	-	Power Supply	10	12
KI0 to KI3	I	Key Input Pin Nos. 0 to 3	1 to 4	23, 24, 1, 2
KI4 to KI7	I	Key Input Pin Nos. 4 to 7	-	3 to 6
REM	O	Data Output Pin	5	7
VDD	-	Power Supply	6	8
SEL	I	Select Pin	7	9
OSCO	O	Oscillator Pin	8	10
OSCI	I	Oscillator Pin	9	11
CCS	I	Custom Code Scan Input Pin	20	22
LMP	-	Output LED Indicator	11	13
KI/O0 to KI/O7	I/O	Key Input/Output Pin Nos. 0 to 7	19 to 12	21 to 14

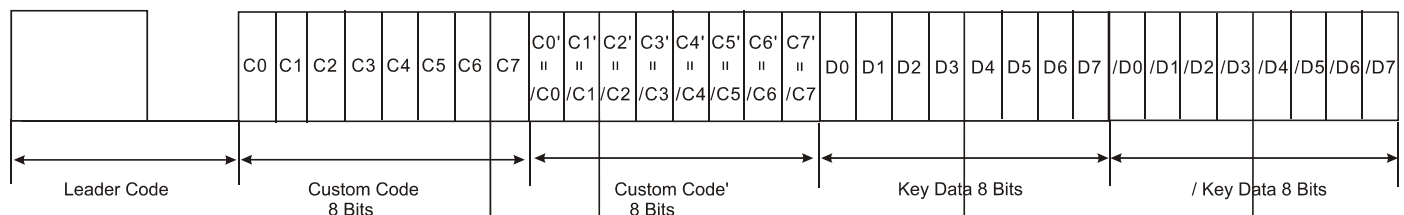
Infrared Remote Control Transmitter

PT2221/PT2222

FUNCTIONAL DESCRIPTION

TRANSMISSION CODE

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



The leader codes consist of a 9 ms carrier waveform followed by a 4.5 ms OFF waveform. It is used as the leader for the following code. Thus, when reception is configured by a microcomputer, the time processes can be managed efficiently. The code uses the PPM (Pulse Position Modulation) Method, with "1" and "0" differentiated by the time between pulses. Each code consists of 8 bits, and simultaneous transmission of the inverse code allows configuration of a system with an extremely low error rate.

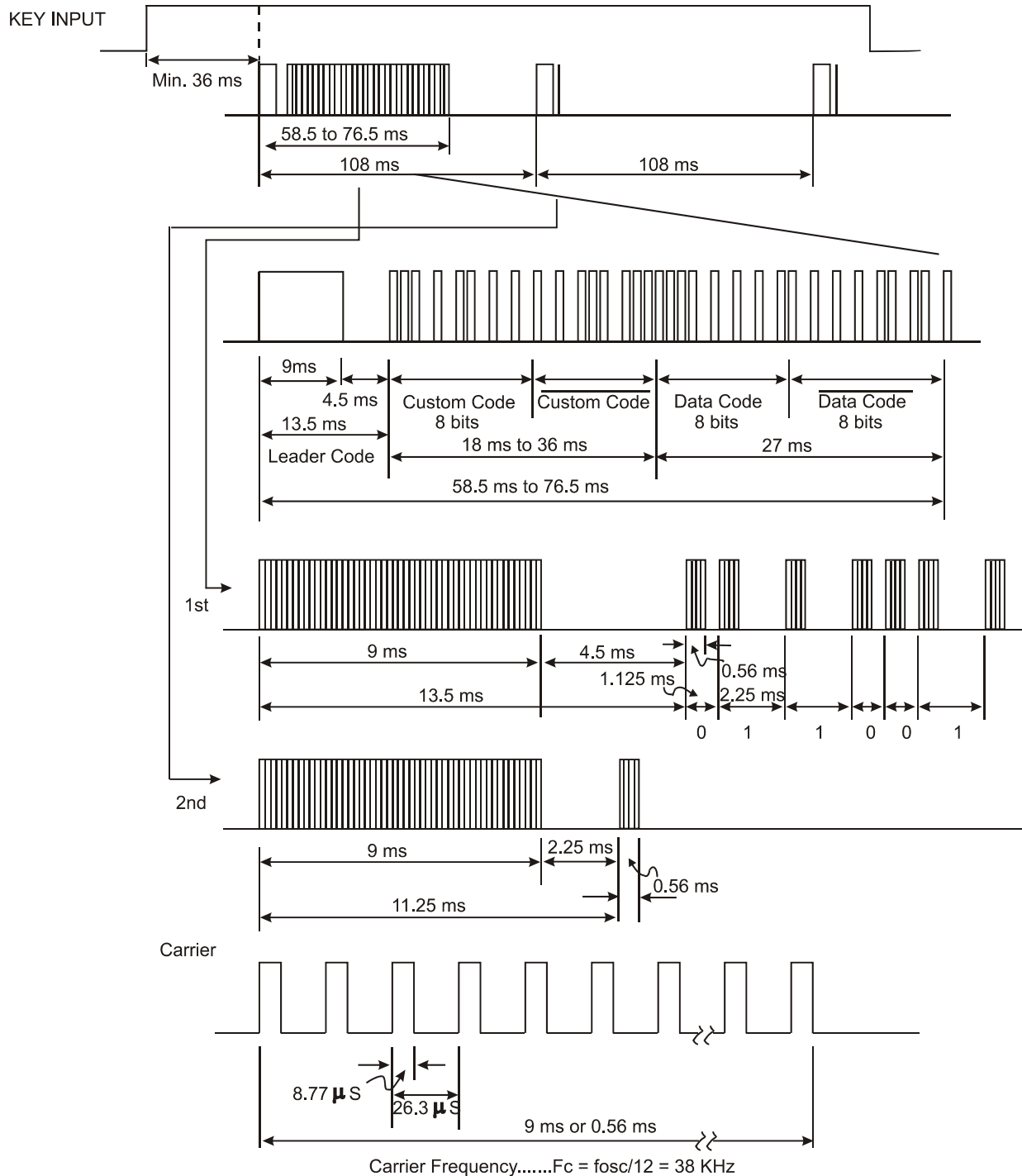
Infrared Remote Control Transmitter

PT2221/PT2222

REMOTE OUTPUT WAVEFORMS

The Remote Output Waveforms are given in the diagram below:

Ex. fosc = 455 KHz



Infrared Remote Control Transmitter

PT2221/PT2222

KEY INPUT

A total of 32 keys can be connected by PT2221's Key Input Pins -- KI0 to KI3 and the Timing Signal Output Pins KI/O0 to KI/O7. PT2222, on the other hand, has a total of 64 keys that can be connected by Key Input Pins -- KI0 to KI7 and Timing Signal Output Pins -- KI/O0 to KI/O7.

Double Key Operation is possible for only Key No. 21 in combination with other keys connected to the KI/O5 line namely: Key No. 22, 23, or 24. Thus, only the following key combinations may be used for the double key operation:

1. Key Nos. 21 and 22
2. Key Nos. 21 and 23
3. Key Nos. 21 and 24

Pull-down resistors are connected between the Key Input and Vss Pins. When more than one key (except the double key combinations: K21+22, K21+K23 and K21+K24) are pressed simultaneously, the transmission output stops.

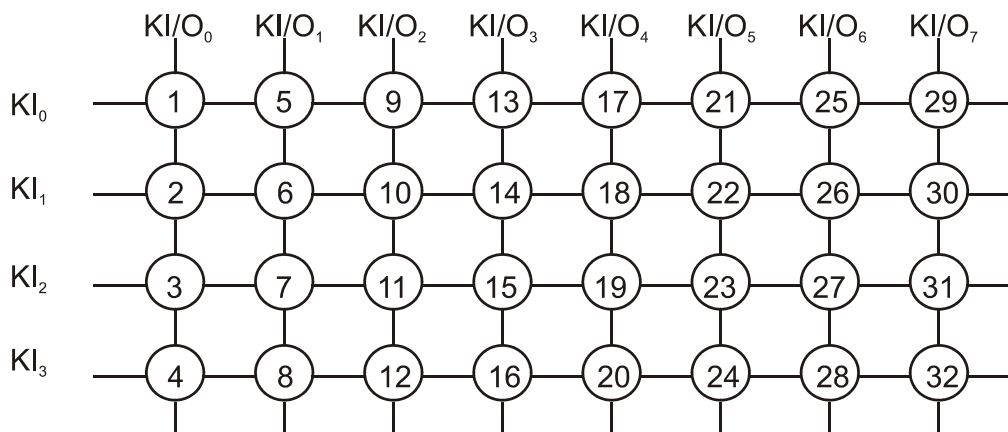
Two key inputs are regarded as being pressed simultaneously when the time interval between these two key entries is less than 36 ms.

The order of priority given to two key inputs with a time interval of more than 36 ms is on a First-Pressed-First-Served or Longer-Pressed-First-Served Basis.

When a key is pressed, the custom and data codes are read. 36 ms later, the Remote (REM) Output is activated. When the key is kept depressed during this 36 ms, one transmission is outputted. If the key is depressed for more than 108 ms, then the only the leader code is transmitted continuously.

PT2221 KEY INPUT MATRIX

The Key Input Matrix of PT2221 is given below:

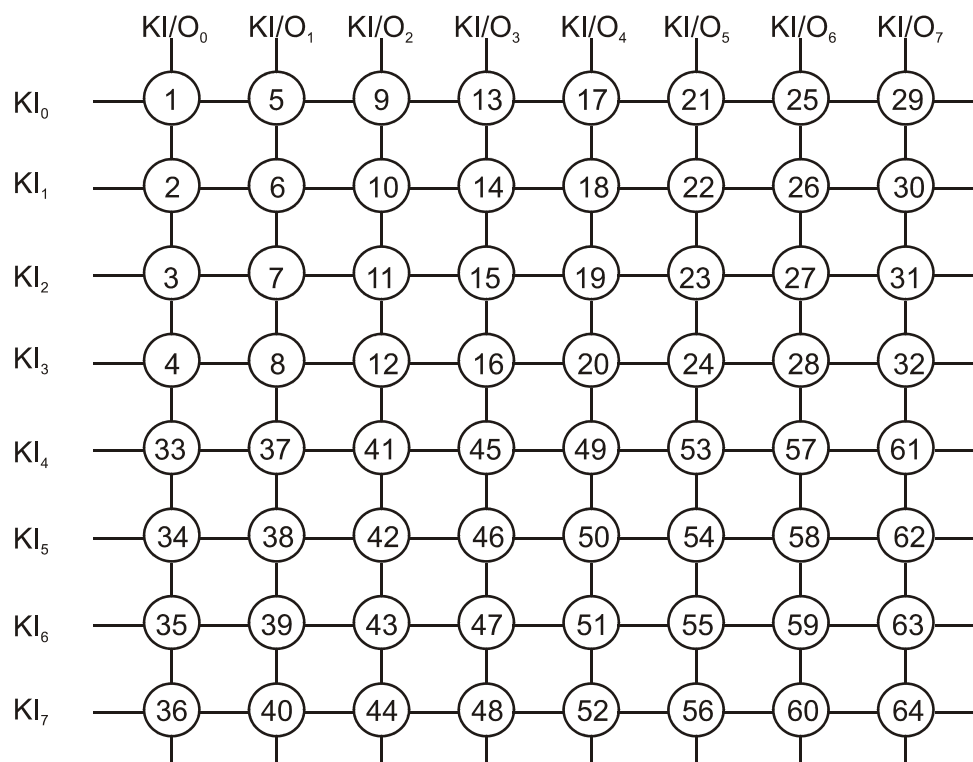


Infrared Remote Control Transmitter

PT2221/PT2222

PT2222 KEY INPUT MATRIX

The Key Input Matrix of PT2222 is given below:



DOUBLE KEY OPERATION

Double Key Operation is useful for operations such as tape deck recording. The following table shows the Key Data corresponding to the double keys pressed. Also refer to the Key Input Section.

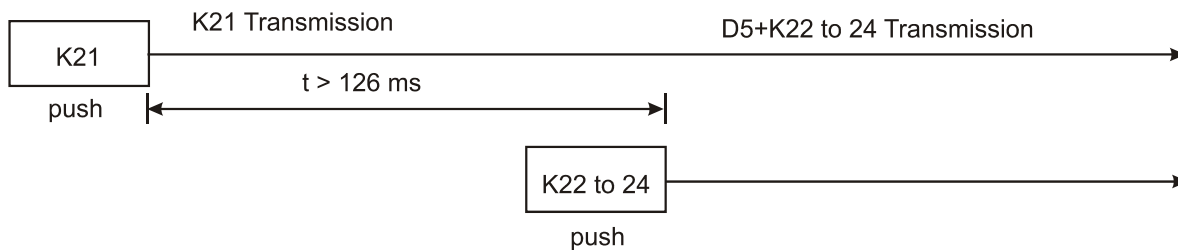
The Double Key Operation forms are as follows:

KEY	D0	D1	D2	D3	D4	D5	D6	D7
K21 + K22	1	0	1	0	1	1	0	0/1
K21 + K23	0	1	1	0	1	1	0	0/1
K21 + K24	1	1	1	0	1	1	0	0/1

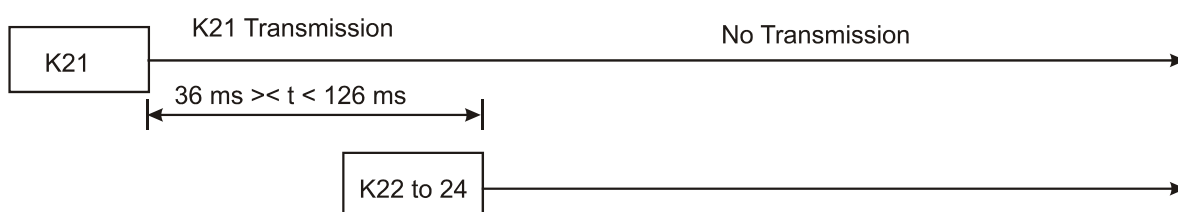
Infrared Remote Control Transmitter

PT2221/PT2222

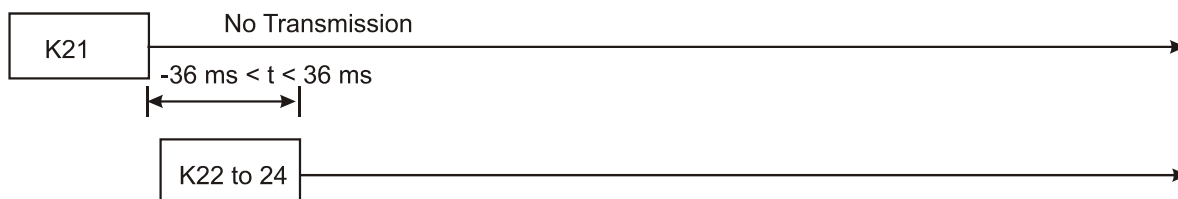
Operation



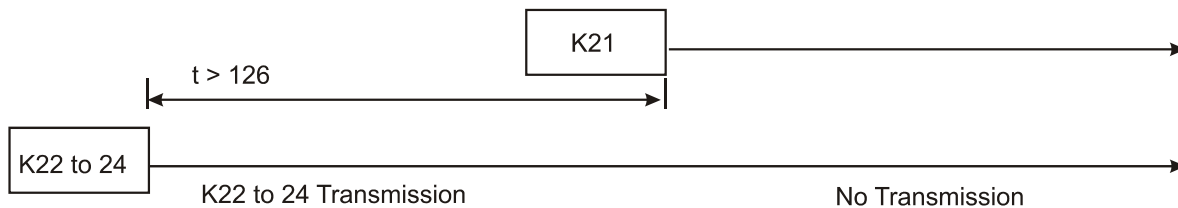
No Operation



No Operation



No Operation



Infrared Remote Control Transmitter
PT2221/PT2222

PT2221 KEYS DATA CODE

Key	CONNECTION					DATA CODE							
	KI0	KI1	KI2	KI3	KI/O	D0	D1	D2	D3	D4	D5	D6	D7
K1	*					0	0	0	0	0	0	0	0/1
K2		*			KI/O0	1	0	0	0	0	0	0	0/1
K3			*			0	1	0	0	0	0	0	0/1
K4				*		1	1	0	0	0	0	0	0/1
K5	*					0	0	1	0	0	0	0	0/1
K6		*			KI/O1	1	0	1	0	0	0	0	0/1
K7			*			0	1	1	0	0	0	0	0/1
K8				*		1	1	1	0	0	0	0	0/1
K9	*					0	0	0	1	0	0	0	0/1
K10		*			KI/O2	1	0	0	1	0	0	0	0/1
K11			*			0	1	0	1	0	0	0	0/1
K12				*		1	1	0	1	0	0	0	0/1
K13	*					0	0	1	1	0	0	0	0/1
K14		*			KI/O3	1	0	1	1	0	0	0	0/1
K15			*			0	1	1	1	0	0	0	0/1
K16				*		1	1	1	1	0	0	0	0/1
K17	*					0	0	0	0	1	0	0	0/1
K18		*			KI/O4	1	0	0	0	1	0	0	0/1
K19			*			0	1	0	0	1	0	0	0/1
K20				*		1	1	0	0	1	0	0	0/1
K21	*					0	0	1	0	1	0	0	0/1
K22		*			KI/O5	1	0	1	0	1	0	0	0/1
K23			*			0	1	1	0	1	0	0	0/1
K24				*		1	1	1	0	1	0	0	0/1
K25	*					0	0	0	1	1	0	0	0/1
K26		*			KI/O6	1	0	0	1	1	0	0	0/1
K27			*			0	1	0	1	1	0	0	0/1
K28				*		1	1	0	1	1	0	0	0/1
K29	*					0	0	1	1	1	0	0	0/1
K30		*			KI/O7	1	0	1	1	1	0	0	0/1
K31			*			0	1	1	1	1	0	0	0/1
K32				*		1	1	1	1	1	0	0	0/1

Infrared Remote Control Transmitter
PT2221/PT2222

PT2222 KEYS DATA CODE

Key	CONNECTION					DATA CODE							
	KI0	KI1	KI2	KI3	KI/O	D0	D1	D2	D3	D4	D5	D6	D7
K1	*					0	0	0	0	0	0	0	0/1
K2		*			KI/O0	1	0	0	0	0	0	0	0/1
K3			*			0	1	0	0	0	0	0	0/1
K4				*		1	1	0	0	0	0	0	0/1
K5	*					0	0	1	0	0	0	0	0/1
K6		*			KI/O1	1	0	1	0	0	0	0	0/1
K7			*			0	1	1	0	0	0	0	0/1
K8				*		1	1	1	0	0	0	0	0/1
K9	*					0	0	0	1	0	0	0	0/1
K10		*			KI/O2	1	0	0	1	0	0	0	0/1
K11			*			0	1	0	1	0	0	0	0/1
K12				*		1	1	0	1	0	0	0	0/1
K13	*					0	0	1	1	0	0	0	0/1
K14		*			KI/O3	1	0	1	1	0	0	0	0/1
K15			*			0	1	1	1	0	0	0	0/1
K16				*		1	1	1	1	0	0	0	0/1
K17	*					0	0	0	0	1	0	0	0/1
K18		*			KI/O4	1	0	0	0	1	0	0	0/1
K19			*			0	1	0	0	1	0	0	0/1
K20				*		1	1	0	0	1	0	0	0/1
K21	*					0	0	1	0	1	0	0	0/1
K22		*			KI/O5	1	0	1	0	1	0	0	0/1
K23			*			0	1	1	0	1	0	0	0/1
K24				*		1	1	1	0	1	0	0	0/1
K25	*					0	0	0	1	1	0	0	0/1
K26		*			KI/O6	1	0	0	1	1	0	0	0/1
K27			*			0	1	0	1	1	0	0	0/1
K28				*		1	1	0	1	1	0	0	0/1
K29	*					0	0	1	1	1	0	0	0/1
K30		*			KI/O7	1	0	1	1	1	0	0	0/1
K31			*			0	1	1	1	1	0	0	0/1
K32				*		1	1	1	1	1	0	0	0/1

Infrared Remote Control Transmitter
PT2221/PT2222

Key	CONNECTION					DATA CODE							
	KI4	KI5	KI6	KI7	KI/O	D0	D1	D2	D3	D4	D5	D6	D7
K33	*					0	0	0	0	0	0	1	0/1
K34		*			KI/O0	1	0	0	0	0	0	1	0/1
K35			*			0	1	0	0	0	0	1	0/1
K36				*		1	1	0	0	0	0	1	0/1
K37	*					0	0	1	0	0	0	1	0/1
K38		*			KI/O1	1	0	1	0	0	0	1	0/1
K39			*			0	1	1	0	0	0	1	0/1
K40				*		1	1	1	0	0	0	1	0/1
K41	*					0	0	0	1	0	0	1	0/1
K42		*			KI/O2	1	0	0	1	0	0	1	0/1
K43			*			0	1	0	1	0	0	1	0/1
K44				*		1	1	0	1	0	0	1	0/1
K45	*					0	0	1	1	0	0	1	0/1
K46		*			KI/O3	1	0	1	1	0	0	1	0/1
K47			*			0	1	1	1	0	0	1	0/1
K48				*		1	1	1	1	0	0	1	0/1
K49	*					0	0	0	0	1	0	1	0/1
K50		*			KI/O4	1	0	0	0	1	0	1	0/1
K51			*			0	1	0	0	1	0	1	0/1
K52				*		1	1	0	0	1	0	1	0/1
K53	*					0	0	1	0	1	0	1	0/1
K54		*			KI/O5	1	0	1	0	1	0	1	0/1
K55			*			0	1	1	0	1	0	1	0/1
K56				*		1	1	1	0	1	0	1	0/1
K57	*					0	0	0	1	1	0	1	0/1
K58		*			KI/O6	1	0	0	1	1	0	1	0/1
K59			*			0	1	0	1	1	0	1	0/1
K60				*		1	1	0	1	1	0	1	0/1
K61	*					0	0	1	1	1	0	1	0/1
K62		*			KI/O7	1	0	1	1	1	0	1	0/1
K63			*			0	1	1	1	1	0	1	0/1
K64				*		1	1	1	1	1	0	1	0/1

Infrared Remote Control Transmitter
PT2221/PT2222

ELECTRICAL CHARACTERISTICS

(Ta = 25 °C, VDD = 3.0 V)

Characteristic	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	VDD		2.0	3.0	5.5	V
Current Consumption 1	IDD1	fosc=455 KHz		0.1	1.0	mA
Current Consumption 2	IDD2	fosc=STOP			1.0	μA
REM High Level Output Current	IOH1	VO=1.5V	-5.0	-8.0		mA
REM Low Level Output Current	IOL1	VO=0.3V	15	30		μA
LMP High Level Output Current	IOH2	VO=2.7V	-15	-30		μA
LMP Low Level Output Current	IOL2	VO=0.3V	1	1.5		mA
KI High Level Input Current	IIH1	VIN=3.0V	5		30	μA
KI Low Level Input Current	IIL1	VIN=0V			-0.2	μA
KI High Level Input Voltage	VIH1		0.7VDD		VDD	V
KI Low Level Input Voltage	VIL1		0		0.3VDD	V
KI/O High Level Input Voltage	VIH2		0.7VDD		VDD	V
KI/O Low Level Input Voltage	VIL2		0		0.4	V
KI/O High Level Input Current	IIH2	VIN=3.0V			7	μA
KI/O Low Level Input Current	IIL2	VIN=0V			-0.2	μA
KI/O High Level Output Current	IOH3	VO=2.5V	0.5	2.5		mA
KI/O Low Level Output Current	IOL3	VO=1.7V	35	100		μA
CCS Low Level Input Voltage	VIH3		1.1			V
CCS High Level Input Current	IIH3	Pull up VIN=3.0V			0.2	μA
CCS Low Level Input Current	IIL3	Pull up VIN=0V	-3		-15	μA
CCS High Level Input Current	IIH4	Pull down VIN=3.0V	5		30	μA
CCS Low Level Input Current	IIL4	Pull down VIN=0V			-0.2	μA

Infrared Remote Control Transmitter**PT2221/PT2222**

ABSOLUTE MAXIMUM RATING

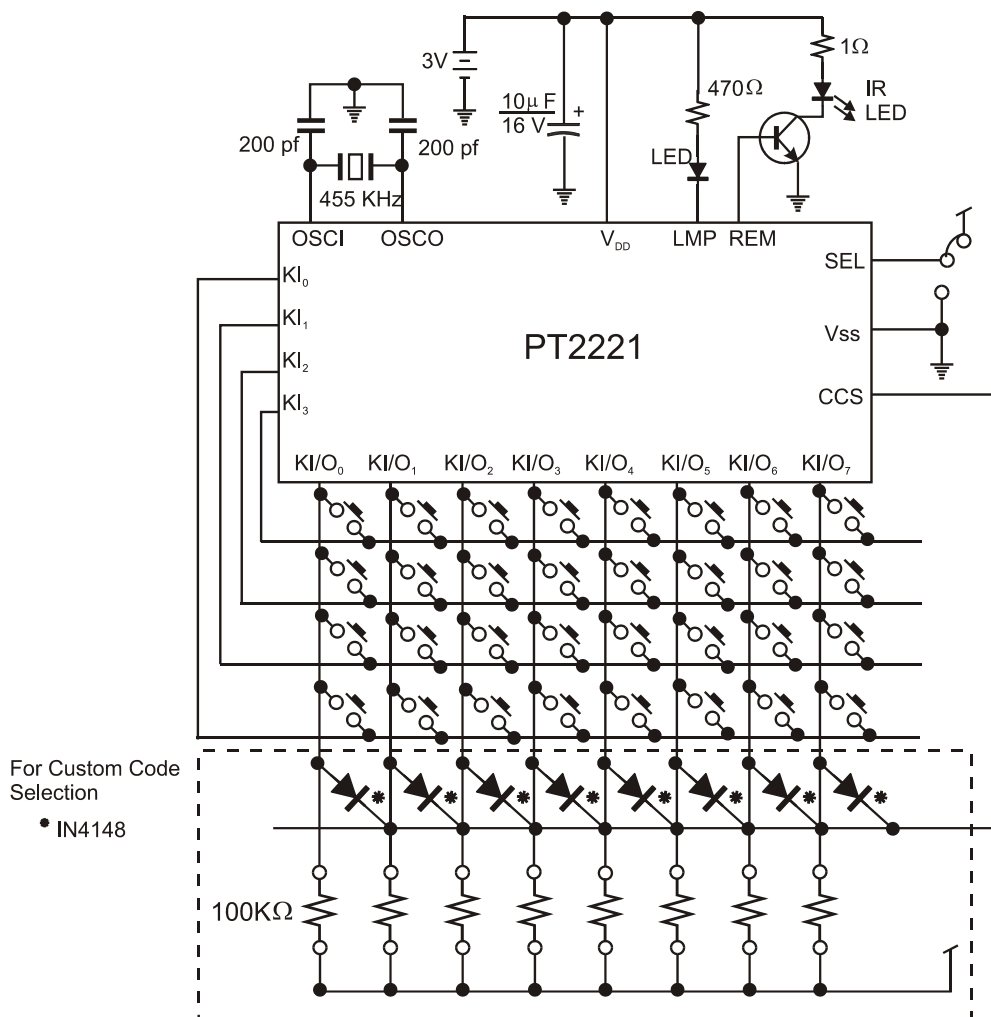
(Ta = 25 °C)

Parameter	Symbol	Rating	Unit
Supply Voltage	VDD	6.0	V
Input Voltage	VIN	-0.3 to VDD	V
Power Dissipation	Pd	250	mW
Operating Temperature	Topr	-40 to +85	°C
Storage Temperature	Tstg	-65 to +150	°C

RECOMMENDED OPERATING CONDITIONS

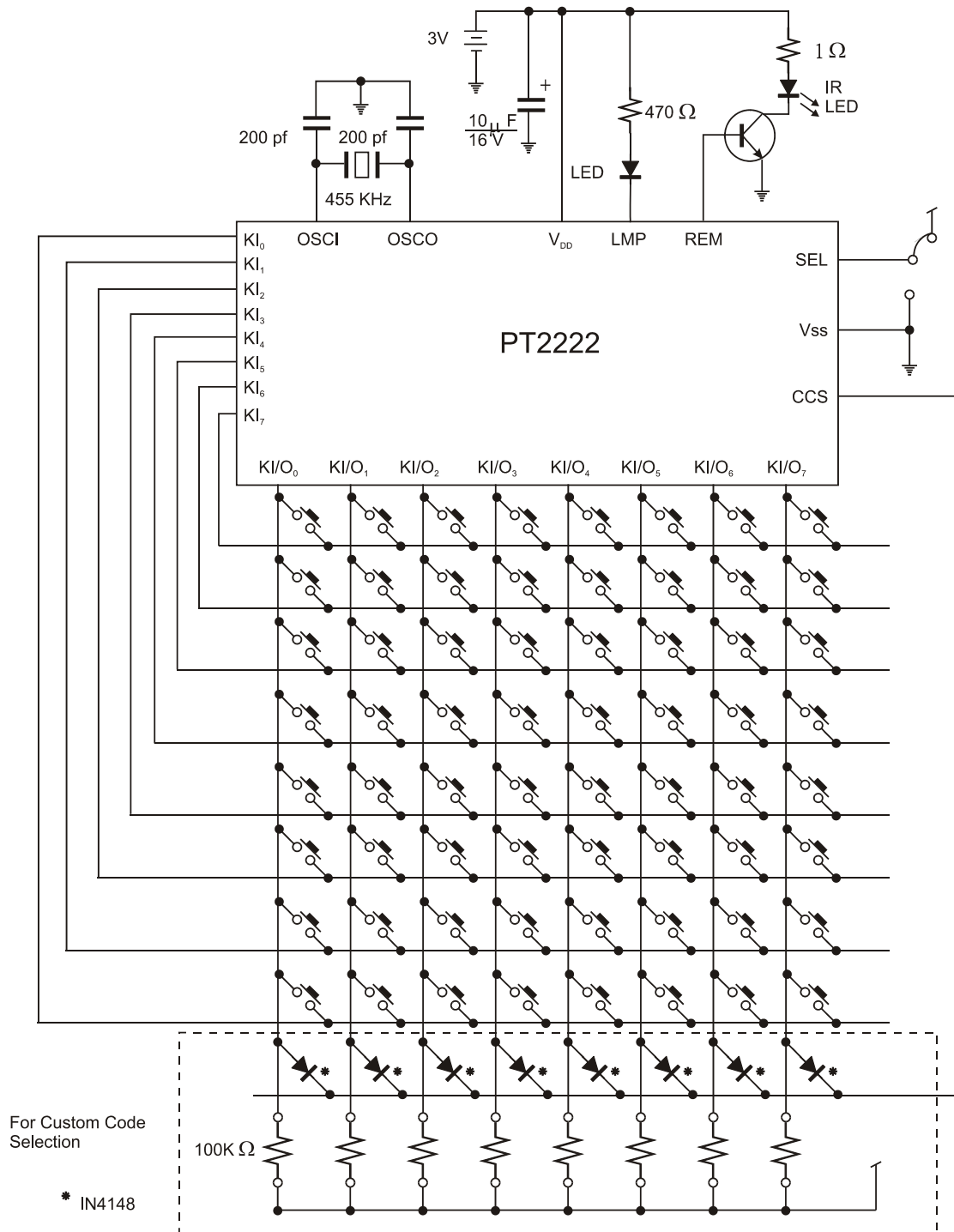
Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	VDD	2.0	3.0	3.3	V
Oscillation Frequency	fosc	400	455	500	KHz
Input Voltage	VIN	0	-	VDD	V
Custom Code Select Pull-up Resistance	Rup	-	100	-	KΩ

PT2221 APPLICATION CIRCUIT



Note: The Vcc and Vss Terminals must be "SHORT" before the batteries are loaded to the transmitter handset to insure that PT2221 Power On Reset Function will operate properly.

PT2222 APPLICATION CIRCUIT



Note: The Vcc and Vss Terminals must be "SHORT" before the batteries are loaded to the transmitter handset to insure that PT2222 Power On Reset Function will operate properly.

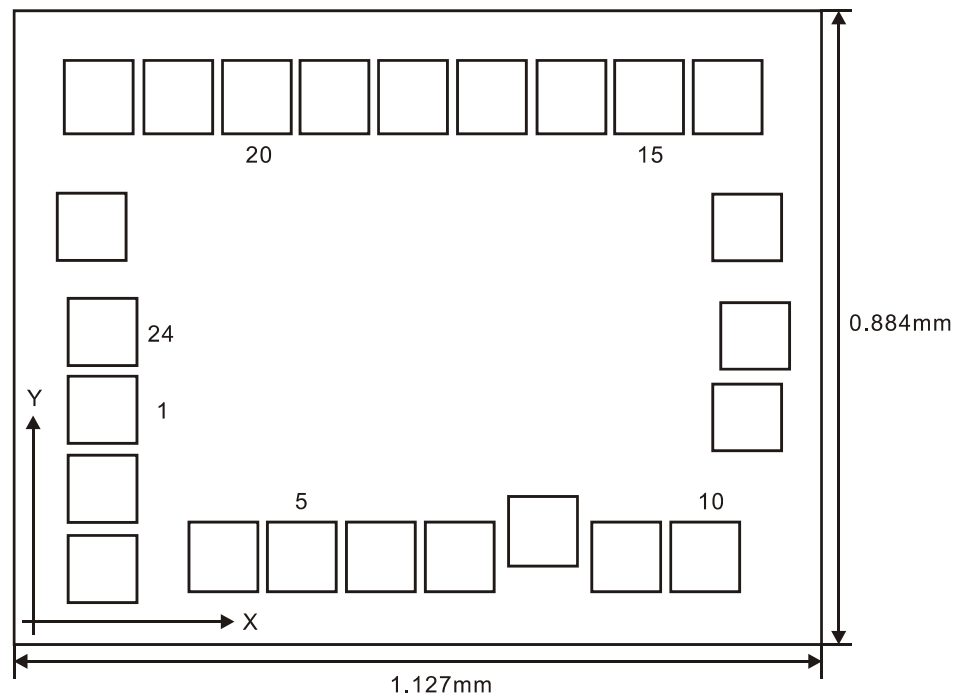
Infrared Remote Control Transmitter

PT2221/PT2222

PAD CONFIGURATION

Chip size:
X = 1127 μ m
Y = 884 μ m

Pad size:
99 x 95 μ m



Infrared Remote Control Transmitter
PT2221/PT2222

PAD LOCATION

Unit: μm

PAD No.	NAME	X	Y
1	KI2	91.6	297.7
2	KI3	91.6	187.7
3	KI4	91.6	77.7
4	KI5	259.6	91.6
5	KI6	369.6	91.6
6	KI7	479.6	91.6
7	REM	589.6	91.6
8	VCC	706.8	129.3
9	SEL	825.3	94.4
10	OSCO	935.3	94.4
11	OSCI	992.85	290.35
12	GND	1004.85	404.2
13	LMP	992.85	556.7
14	KIO7	964.2	737.6
15	KIO6	854.2	737.6
16	KIO5	744.2	737.6
17	KIO4	634.2	737.6
18	KIO3	524.2	737.6
19	KIO2	414.2	737.6
20	KIO1	304.2	737.6
21	KIO0	194.2	737.6
22	CCS	84.2	737.6
23	KI0	74.5	554.85
24	KI1	91.5	407.7

Infrared Remote Control Transmitter**PT2221/PT2222****ORDER INFORMATION**

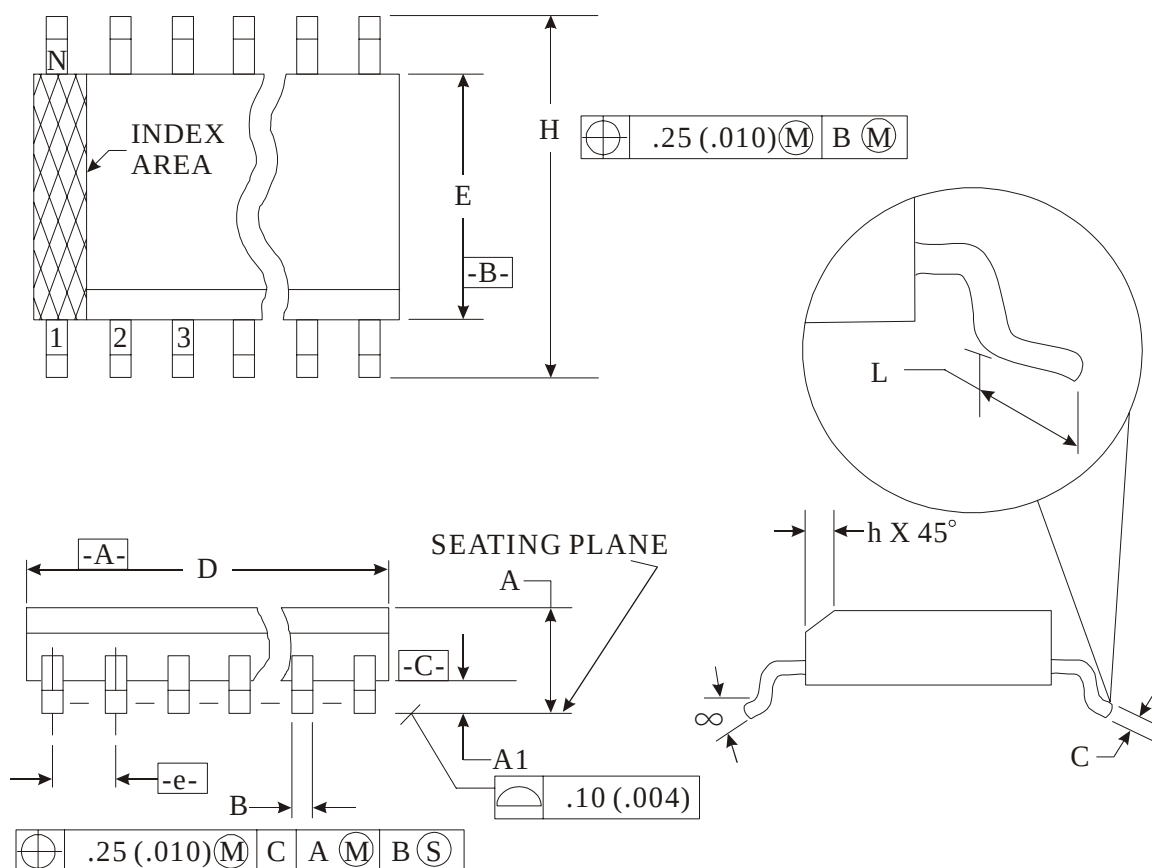
Valid Part Number	Package	Top Code
PT2221-001-D	20-Pin, DIP, 300mil	PT2221-001-D
PT2221-001	20-Pin, SO, 300mil	PT2221-001
PT2221-002	20-Pin, SO, 300mil	PT2221-002
PT2222-001	24-Pin, SO, 300mil	PT2222-001
PT2222-002	24-Pin, SO, 300mil	PT2222-002
PT2222-001	COB	-
PT2221-001-D (L)	20-Pin, DIP, 300mil	PT2221-001-D
PT2221-001 (L)	20-Pin, SO, 300mil	PT2221-001
PT2221-002 (L)	20-Pin, SO, 300mil	PT2221-002
PT2222-001 (L)	24-Pin, SO, 300mil	PT2222-001
PT2222-002 (L)	24-Pin, SO, 300mil	PT2222-002

Notes:

1. (L) = Lead Free
2. The Lead Free mark is put in front of the date code.

PT2221 PACKAGE INFORMATION

20-PIN SO PACKAGE (300 MIL)



Symbol	Dimensions In Millimeter		
	Min.	Nom.	Max.
A	2.35		2.65
A1	0.10		0.30
B	0.33		0.51
C	0.23		0.32
D	12.60		13.00
E	7.40		7.60
e		1.27 bsc.	
H	10.00		10.65
h	0.25		0.75
L	0.40		1.27
α	0°		8°

Infrared Remote Control Transmitter**PT2221/PT2222****Notes:**

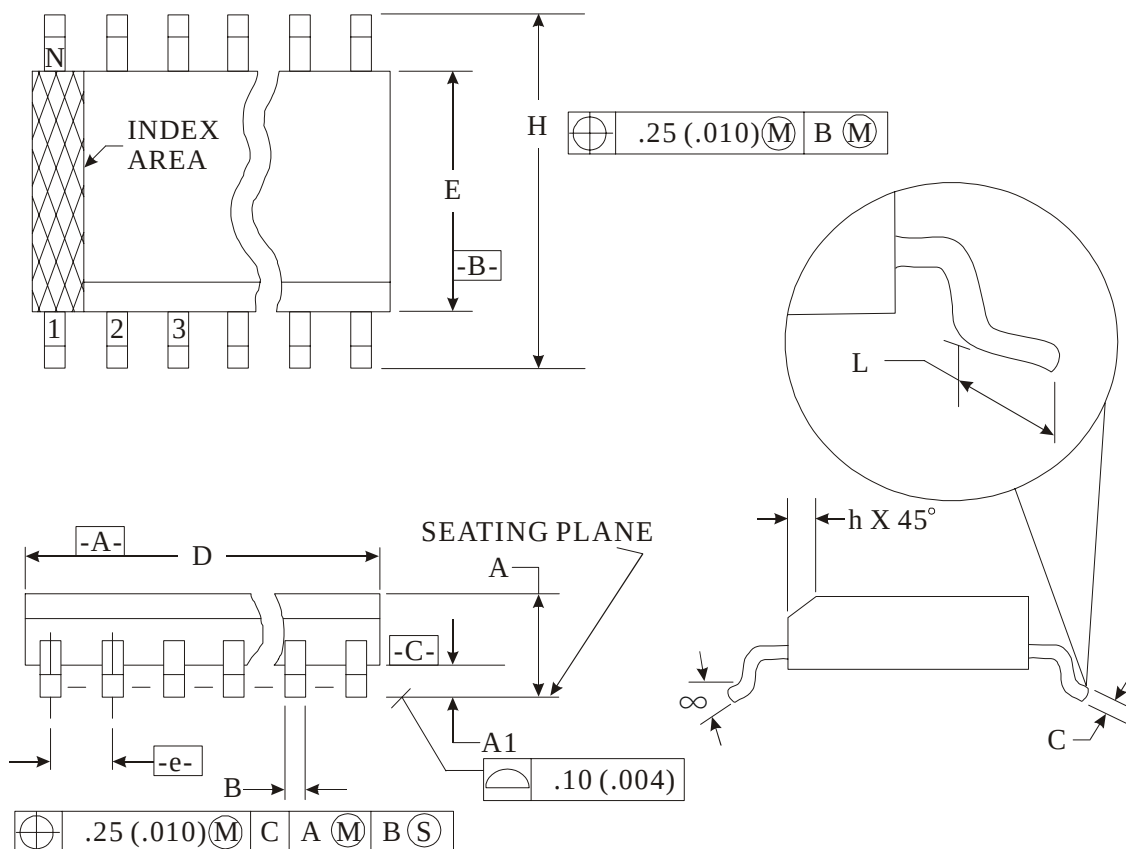
1. Dimensioning and tolerancing per ANSI Y14.5-1982.
2. Dimension "D" does not include mold flash , protrusions or gate burrs. Mold Flash, protrusion or gate burrs shall not exceed 0.15mm (0.006 in) per side.
3. Dimension "E" does not include interlead flash or protrusions. Interlead flash or protrusions shall not exceed 0.25 mm (0.010 in) per side.
4. The chamfer on the body is optional. If it is not present, a visual index feature must be located within the crosshatched area.
5. "L" is the length of the terminal for soldering to a substrate.
6. "N" is the number of terminal positions. (N=20)
7. The lead width "B" as measured 0.36 mm (0.014 in) or greater above the seating plane, shall not exceed a maximum value of 0.61 mm (0.24 in).
8. Controlling dimension: MILLIMETER.
9. Refer to JEDEC MS-013 Variation AC.

JEDEC is the trademark of JEDEC SOLID STATE TECHNOLOGY ASSOCIATION.

Infrared Remote Control Transmitter

PT2221/PT2222

24-PIN, SO PACKAGE (300 MIL)



Symbol	Dimension in Millimeters		
	Min.	Nom.	Max.
A	2.35		2.65
A1	0.10		0.30
B	0.33		0.51
C	0.23		0.32
D	15.20		15.60
E	7.40		7.60
e		1.27 bsc.	
H	10.00		10.65
h	0.25		0.75
L	0.40		1.27
	0o		8o

Infrared Remote Control Transmitter**PT2221/PT2222****Notes:**

1. Dimensioning and tolerancing per ANSI Y14.5-1982.
2. Dimension "D" does not include mold flash , protrusions or gate burrs. Mold Flash, protrusion or gate burrs shall not exceed 0.15mm (0.006 in) per side.
3. Dimension "E" does not include interlead flash or protrusions. Interlead flash or protrusions shall not exceed 0.25 mm (0.010 in) per side.
4. The chamfer on the body is optional. It is not present, a visual index feature must be located within the crosshatched area.
5. "L" is the length of the terminal for soldering to a substrate.
6. "N" is the number of terminal positions. (N=24)
7. The lead width "B" as measured 0.36 mm (0.014 in) or greater above the seating plane, shall not exceed a maximum value of 0.61 mm (0.24 in).
8. Controlling dimension: MILLIMETER.
9. Refer to JEDEC MS-013 Variation AD

JEDEC is the trademark of JEDEC SOLID STATE TECHNOLOGY ASSOCIATION.