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URL: http://www.princeton.com.tw

Infrared Remote Control Transmitter **PT2248**

DESCRIPTION

PT2248 is an infrared remote control transmitter utilizing CMOS Technology. It is capable of 18 functions and a total of 75 commands. Single-shot and continuous keys are available. Furthermore, multiple keying is possible.

FEATURES

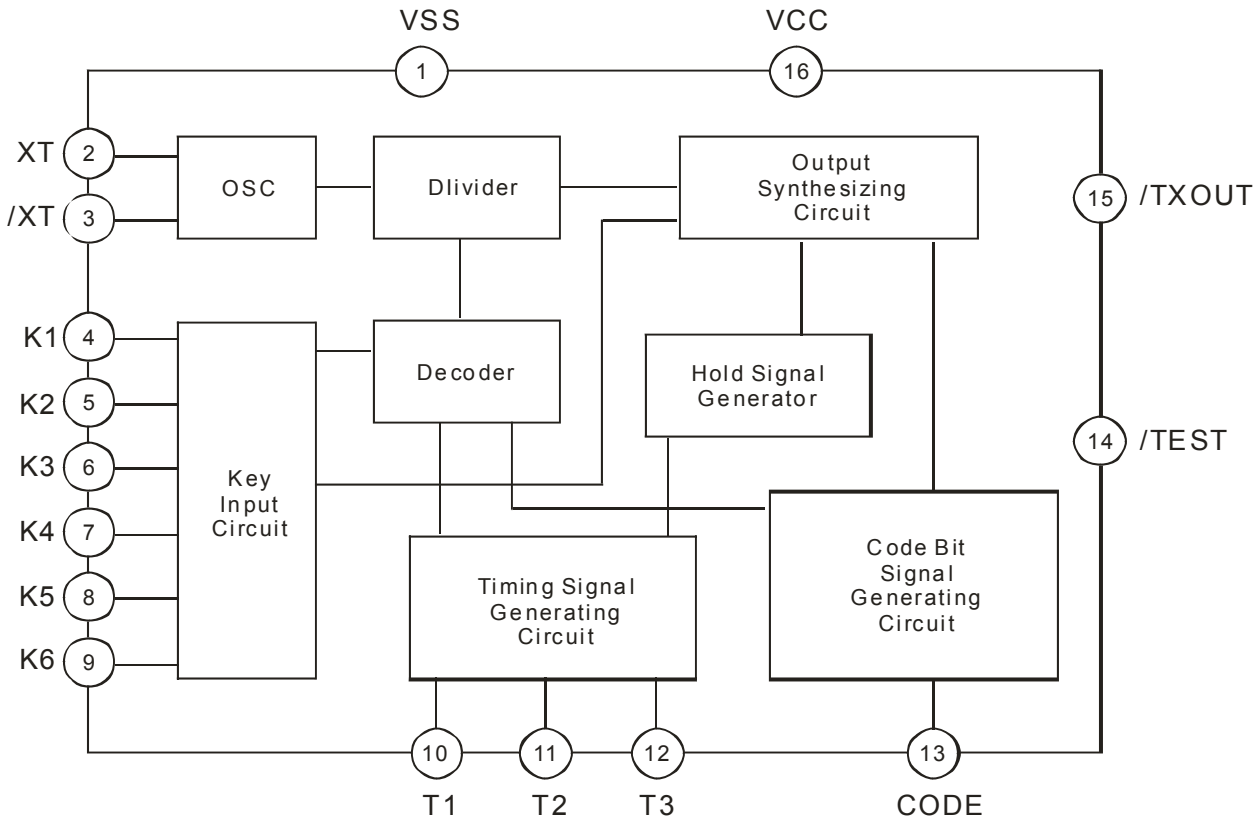
- CMOS Technology
- Low Power Consumption
- Wide Range of Operating Supply Voltage allows Low Voltage Operation (Vcc=2.2 ~ 5.0 V)
- Multiple Keying is Possible (Maximum of 6 Keys)
- Less External Components
- An Oscillator can be constructed by connecting a ceramic resonator at the oscillation circuit

APPLICATIONS

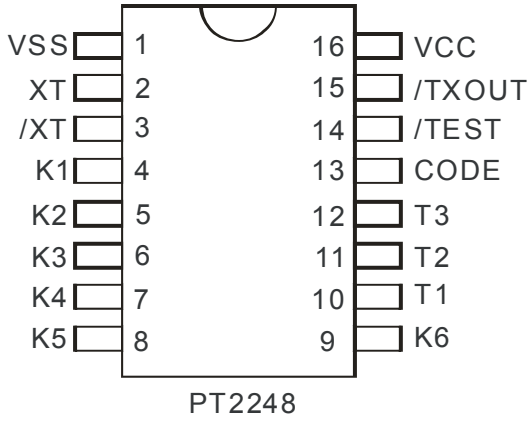
- Television (TV) Remote Control Transmitter
- Video Cassette Recorder (VCR) Remote Control Transmitter

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BLOCK DIAGRAM



PIN CONFIGURATION



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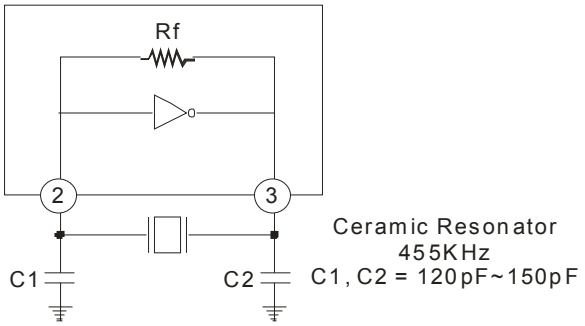
PIN DESCRIPTION

Pin Name	Pin No.	I/O	Description	
VSS	1		Negative Supply Voltage Terminal	
VCC	16		Positive Supply Voltage Terminal	
XT, /XT	2, 3	I, O	OSC Input/Output Terminal for OSC, and used for connecting a 455KHz ceramic resonator, etc.	
K1 ~ K6	4 ~ 9	I	Key Code Input. Key Input Terminals for Key Matrix	18 Keys can be connected at T1 ~ T3 x K1 ~ K6
T1 ~ T3	10 ~ 12	O	Scan Key Code Output. Digital Timing Output Terminals for Key Matrix	(with a built-in pull-down resistor)
/CODE	13	I	Tx/Rx matching Code Common. Terminal for matching code between transmitting and receiving.	
TEST	14	I	Transmitter Key Code Testing Function. Keep this terminal open.	
TXOUT	15	O	Transmitting Signal Output. Transmitting signal consists of 12 bits per word and is modulated by a 38KHz carrier wave.	

FUNCTION DESCRIPTION

OSCILLATION CIRCUIT

When the self-bias type amplifier is housed by CMOS inverter method, the oscillation circuit can be constructed when a ceramic resonator has been connected.



When the oscillation frequency is set at 455 KHz, the carrier wave of the transmitting signal is set at 38 KHz. Unless the keys are being operated, the oscillation is normally stopped; thereby, reducing power consumption.

KEY INPUT

18 Keys can be connected by Key Inputs K1 ~ K6 and timing signals T1 ~ T3.
Multiple Keying (maximum of 6 keys) is possible for the keys connected to T1 line (Output becomes continuous pulses).
The order of priority of the timing signal line is T1, T2, and T3. When 2 or more keys that are connected to T2 (or T3) line are pressed simultaneously, the single output will have the preferential order of K1 ~ K6.
Furthermore, the keys connected to T2 and T3 lines are for single signals and no second signal is transmitted unless input is made after the key is released once.

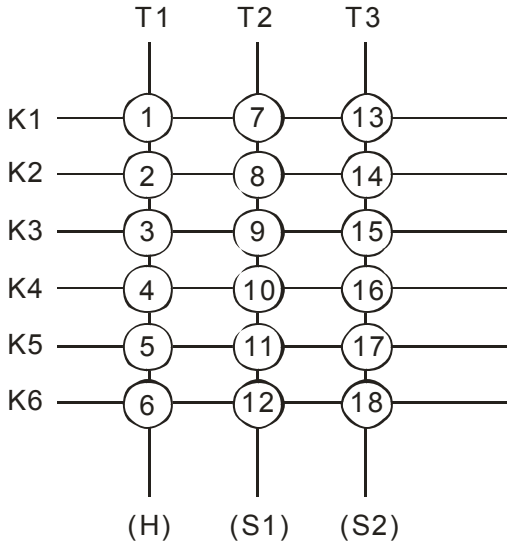
KEY MATRIX

KEY NO. 1~ 6

These are continuous keys. Multiple Keying is possible.

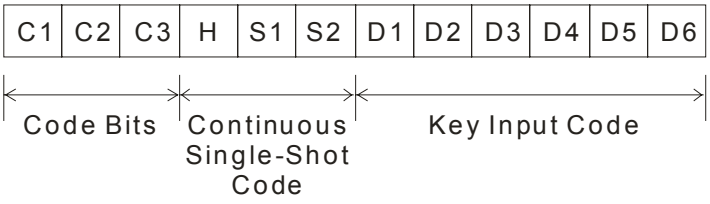
KEY NO. 7 ~ 18

These are single-shot keys. When an input is made, there is only one signal output.



TRANSMISSION COMMAND

The Transmission Command consists of one Command Word. One Command Word is composed of Code Bits (3 bits), Continuous Code (1 Bit), Single-Shot Code (2 bits) and the Key Input Code (6 bits). Thus, one Command Word has 12 bits. C1 ~ C3 are code bits that are adaptable to many models. “H” indicates the continuous signal code while “S1” and “S2” are single-shot signal codes. D1 ~ D6 are key input data codes in 6 bits.



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DATA CODE

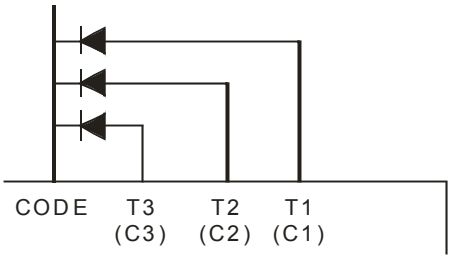
Key No.	Data									Output Form	Key No.	Data									Output Form
	H	S1	S2	D1	D2	D3	D4	D5	D6			H	S1	S2	D1	D2	D3	D4	D5	D6	
1	1	0	0	1	0	0	0	0	0	Continuous	10	0	1	0	0	0	0	1	0	0	Single-Shot
2	1	0	0	0	1	0	0	0	0	Continuous	11	0	1	0	0	0	0	0	1	0	Single-Shot
3	1	0	0	0	0	1	0	0	0	Continuous	12	0	1	0	0	0	0	0	0	1	Single-Shot
4	1	0	0	0	0	0	1	0	0	Continuous	13	0	0	1	1	0	0	0	0	0	Single-Shot
5	1	0	0	0	0	0	0	1	0	Continuous	14	0	0	1	0	1	0	00	0	0	Single-Shot
6	1	0	0	0	0	0	0	0	1	Continuous	15	0	0	1	0	0	1	0	0	0	Single-Shot
7	0	1	0	1	0	0	0	0	0	Single-Shot	16	0	0	1	0	0	0	1	0	0	Single-Shot
8	0	1	0	0	1	0	0	0	0	Single-Shot	17	0	0	1	0	0	0	0	1	0	Single-Shot
9	0	1	0	0	0	1	0	0	0	Single-Shot	18	0	0	1	0	0	0	0	0	2	Single-Shot

Since multiple keying is possible, Key No. 1 ~ 6 (in combination with D1 ~ D6 data) are capable of sending out 63 commands. Key No. 7 ~ 18 are single-shot keys capable of sending out 12 commands. Thus, a total of 75 commands can result from a combination of continuous keys (multiple keying) and single-shot keys.

CODE BITS (C1, C2 AND C3)

Code bits can be made at one terminal with diodes connected through T1 ~ T3 timing terminals.

Data of C1, C2 and C3 Code Bits become “1” when diodes are connected to CODE Terminal through the timing signal terminals -- T1 ~ T3, and “0” when diodes are not connected.



In the diagram above: C1, C2 and C3 are 1, 1, and 1 data respectively.

PT2248 has three (3) Code Bits. The receiving IC -- PT 2249A Series (DIP 16 Pins) can only use C2 and C3 Code Bits, while PT 2250A Series (DIP 24 Pins) are able to use only C1 and C2 Code Bits. Therefore, diodes must be connected so that PT2248 Code Bits Data match with that of the receiving IC.

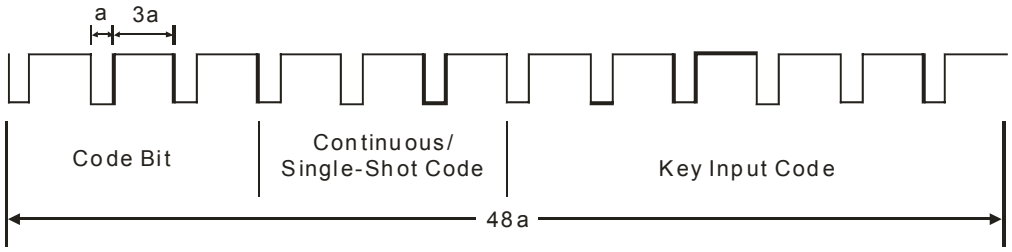
The PT2248 Code Bits Connection Table for PT 2249A / PT 2250A Series Application is given below:

PT2248 Code Pin \ Rx	PT2249A	PT2250A
T1 (C1 Code)	Diode	C1
T2 (C2 Code)	C2	C2
T3 (C3 Code)	C3	Diode

Note: where C1, C2, C3 will be "1" if one diode is connected between CODE and Tn pins; n=1 to 3 in PT2248; otherwise, it will be set to "0".

Note: When communicating with any of the PT2249A Series Receivers, C1 Code Bit Data is not used. Therefore, it is necessary to connect diodes to the Code terminal corresponding to C1 Code Bit of PT2248. (In this way, the C1 Code Bit of PT2248 transmits "1". Likewise, when communicating with any of the PT2250A Series Receivers, C3 Code Bit is not used. Therefore, it is necessary to connect diodes to the Code Terminal corresponding to the C3 Code Bit of PT2248.)

TRANSMITTING WAVEFORM

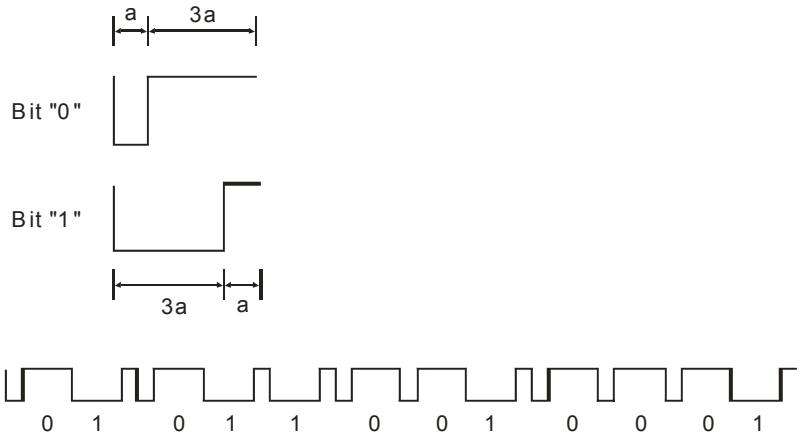


The diagram above shows the basic transmitting waveform. A basic transmitting waveform consists of 12-bits serial data.

The time of bit "a" is dependent on the oscillation frequency (fosc) and is given by the following formula:

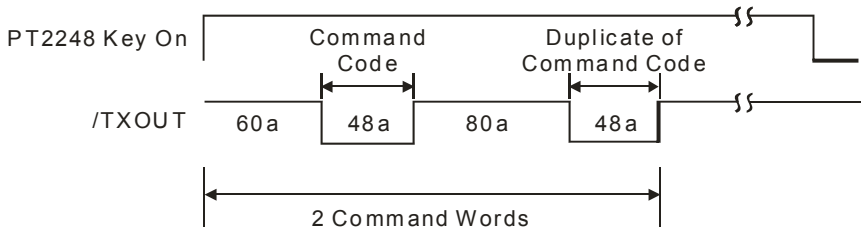
$$a = \frac{1}{fosc} \times 192$$

DISTINCTION OD BIT "1" AND "0"



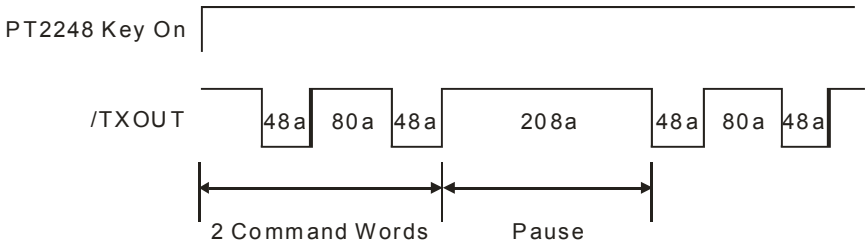
One word of the transmission command is in the configuration of (010110010001).

SINGLE-SHOT SIGNAL



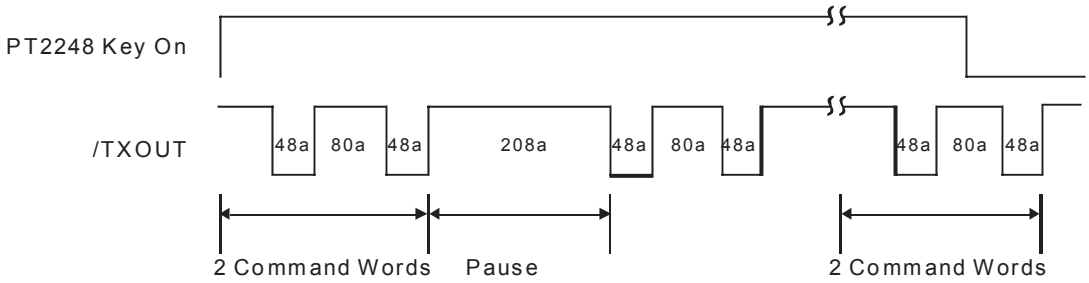
When any one of the single-shot keys is depressed, the above single-shot transmits only 2 command words and then the transmitting output ends.

CONTINUOUS SIGNAL



When any of the continuous keys is depressed, the above continuous signal transmits a repetitive cycle of 2 command words and then a pause (with a pause duration of 208a) until the key is released.

If the key is released during code transmission, PT2248 will still continue to send out the last set of 2 command words and then the transmitting output stops. Please refer to the diagram below:

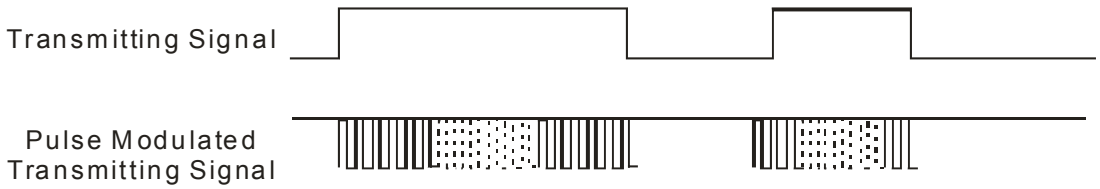


CARRIER WAVE

About 50 ~ 100mA current is normally applied through an infrared LED in order to extend the infrared reaching distance. Therefore, reducing the time when the LED is ON leads to the reduction of power consumption. On PT2248, when the signal is transmitting, each bit is switching by a carrier wave of 1/3 duty. Carrier frequency (fc) is dependent on the oscillation frequency (fosc) and is given by the following formula:

$$a = \frac{fosc}{12} \quad (Hz)$$

where: fc = 38KHz at fosc = 455KHz



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ABSOLUTE MAXIMUM RATINGS

(Ta=25℃)

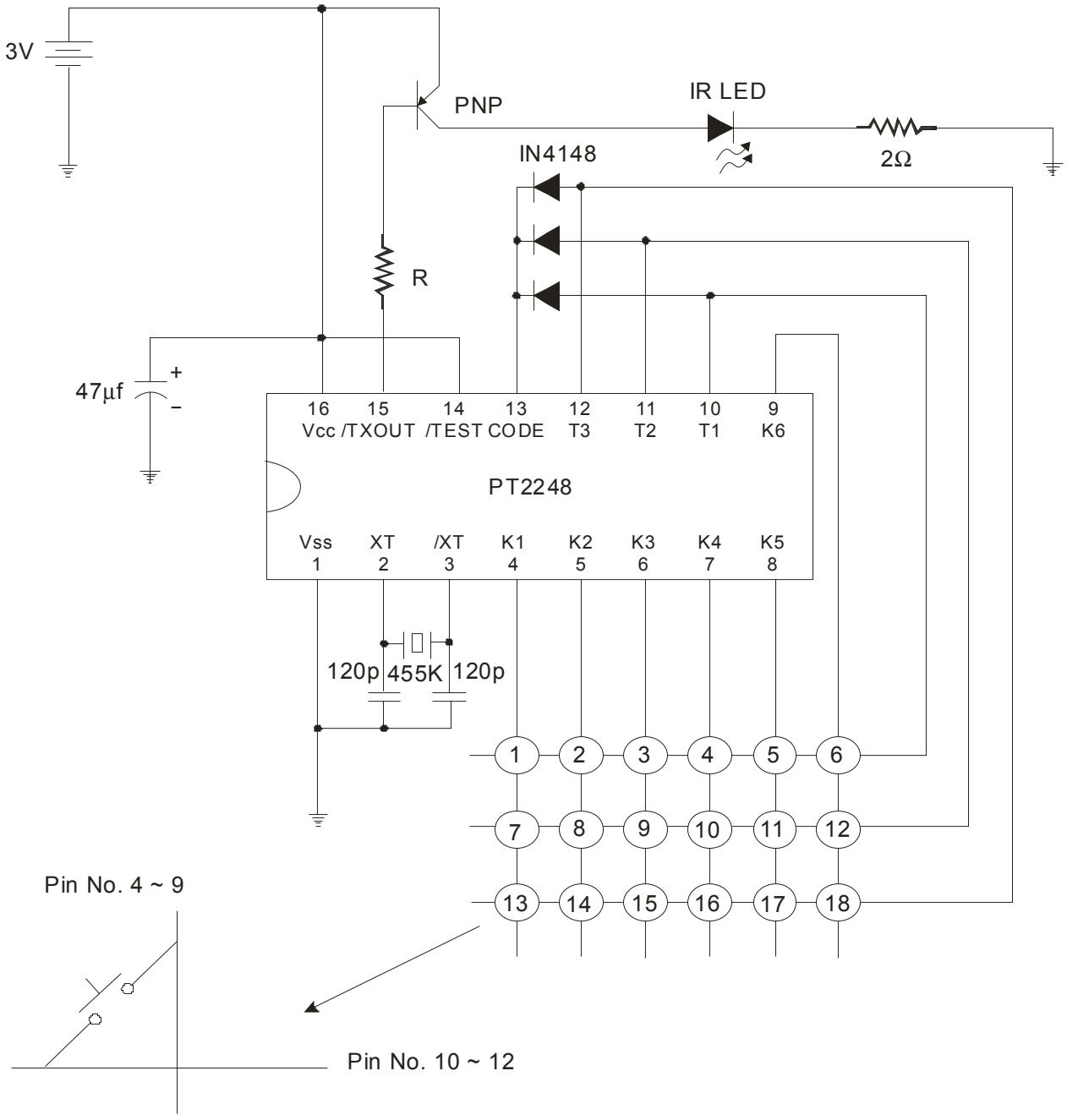
Parameter	Symbol	Ratings	Unit
Supply Voltage	Vcc	5.5	V
Input/Output Voltage	VIN	Vss-0.5 to Vcc+0.5	V
Power Dissipation	Pd	200	mV
Operating Temperature	Topr	-40 ~ +85	℃
Storage Temperature	Tstg	-65~+150	℃
Txout Output Current	Iout	-5	mA

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, Vcc=3V and Ta=25 ℃)

Parameter				Symbol	Conditions	Min.	Typ.	Max.	Unit
Operating Supply Voltage				Vcc	All Function Operations	2.2	-	5.0	V
Operating Supply Voltage				Icc	Key On Without Load	-	-	1.0	mA
Stand-by Current				ISTB	All Keys Off, Stops oscillation	-	1.0	10	μA
Input	K1~K6	Voltage	"H" Level	VIH	-	0.8Vcc	-	Vcc	V
	CODE		"L" Level	VIL	-	0	-	0.5	V
	K1~K6	Current	"H" Level	IIH	VI=3.0V	20	40	60	μA
			"L" Level	IIL	VI=0V	-1.0	-	1.0	μA
Output	T1~T3	Current	"H" Level	IOH	Vo=2.0V	-500	-	-	μA
			"L" Level	IOL	Vo=2.0V	30	-	-	μA
	/TXOUT	Current	"H" Level	IOH	Vo=2.0V	-0.1	-	-	mA
			'L" Level	IOL	Vo=2.0V	1.0	-	-	mA
OSC Feedback Resistor				Rf	-	-	500	-	KΩ
Oscillation Frequency				fosc	-	400	455	600	KHz

APPLICATION CIRCUIT



Notes:
1. R = 200Ω to 3.9 KΩ
2. It is highly recommended that the 47µf capacitor be situated near the Vcc.

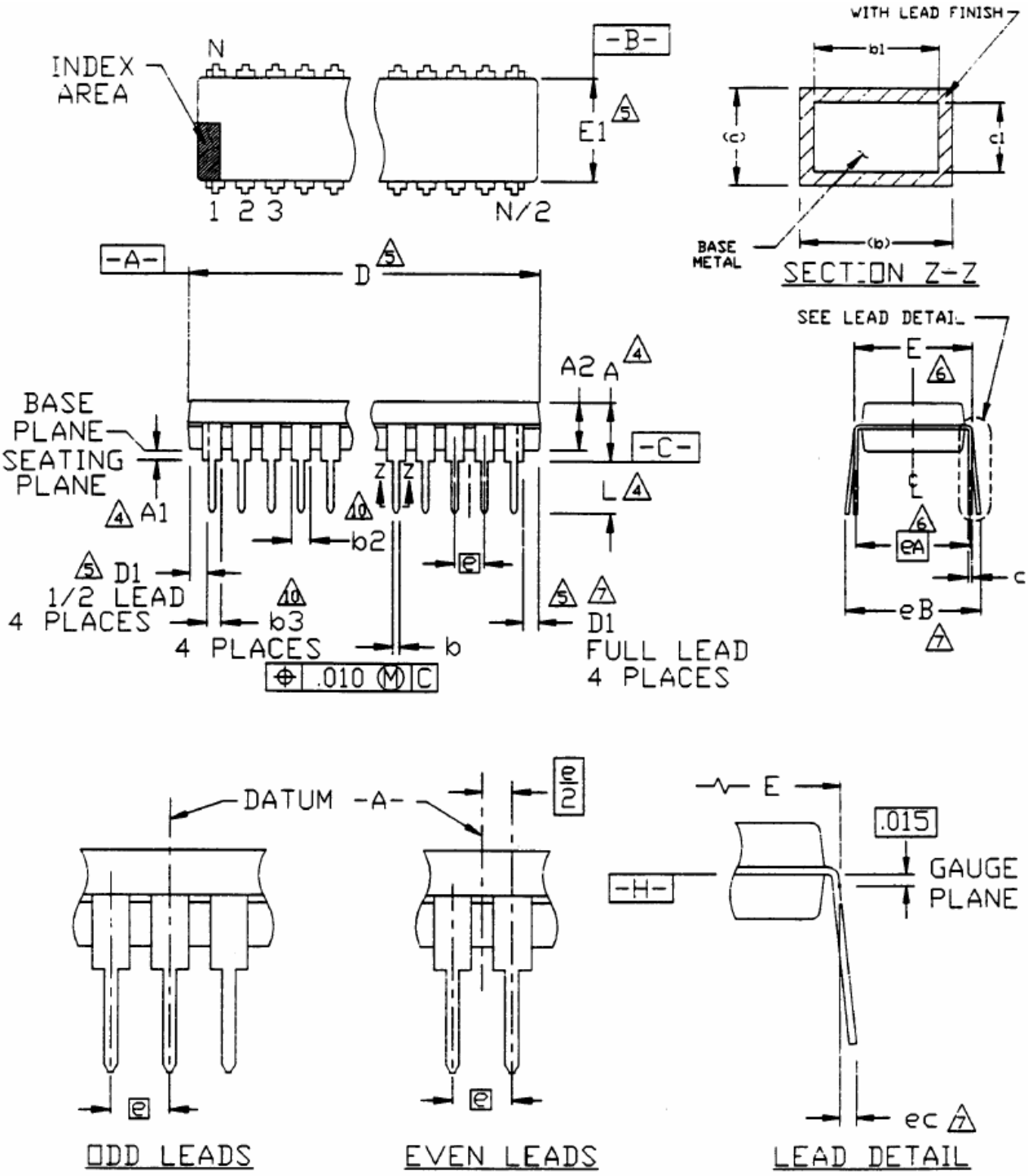
ORDER INFORMATION

Valid Part Number	Package Type	Top Code
PT2248	16 Pins, DIP, 300mil	PT2248
PT2248-S	16 Pins, SOP, 300mil	PT2248-S
PT2248-SN	16 Pins, SOP, 150mil	PT2248-SN
PT2248 (L)	16 Pins, DIP, 300mil	PT2248
PT2248-S (L)	16 Pins, SOP, 300mil	PT2248-S
PT2248-SN (L)	16 Pins, SOP, 150mil	PT2248-SN

Notes:
1. (L), (C) or (S) = Lead Free
2. The Lead Free mark is put in front of the date code.

PACKAGE INFORMATION

16 PINS, DIP, 300 MIL



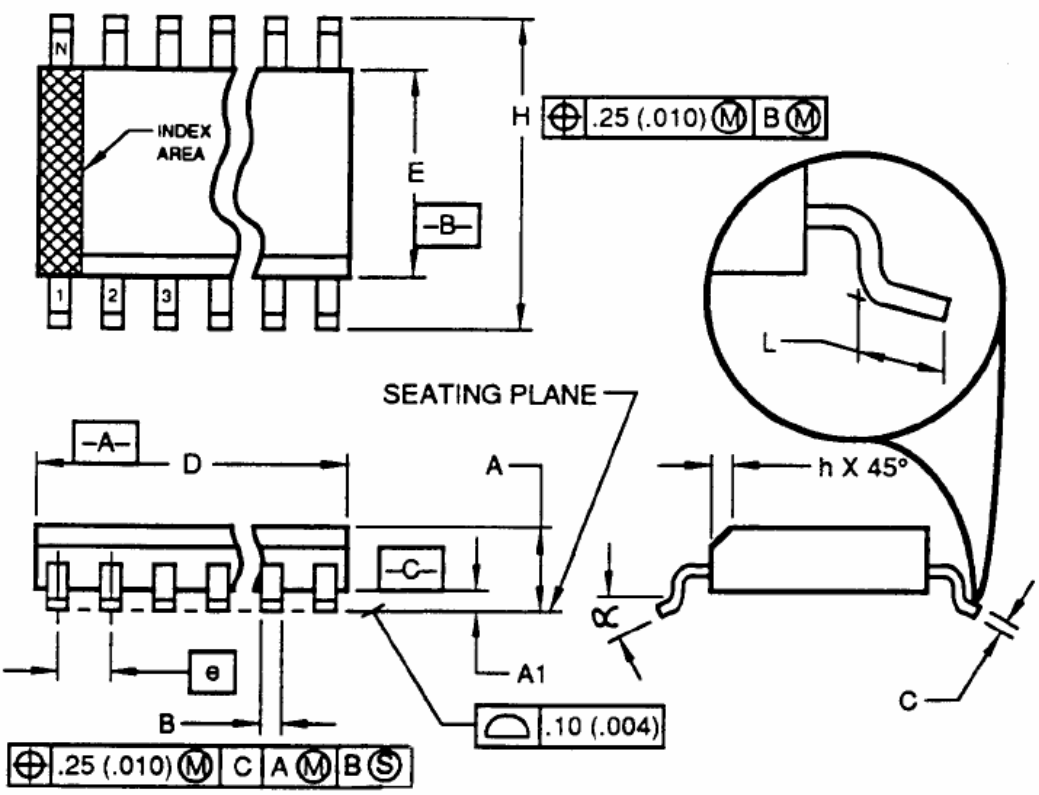
Symbol	Min.	Nom.	Max.
A	-	-	0.210
A1	0.015	-	-
A2	0.115	0.130	0.195
b	0.014	0.018	0.022
b1	0.014	0.018	0.020
b2	0.045	0.060	0.070
b3	0.030	0.039	0.045
c	0.008	0.010	0.014
c1	0.008	0.010	0.011
D	0.780	0.790	0.800
D1	0.005	-	-
E	0.300	0.310	0.325
E1	0.240	0.250	0.280
e	0.100 BSC.		
eA	0.300 BSC.		
eB	-	-	0.430
eC	0.000	-	0.060
L	0.115	0.130	0.150

Notes:
1. All dimensions are in INCHES.
2. Dimensioning and tolerancing per ANSI Y14.5M-1982.
3. Dimensions “A”, “A1” and “L” are measured with the package seated in JEDEC Seating Plane Gauge GS-3.
4. “D”, “D1” and “E1” dimensions do not include mold flash or protrusions. Mold flash or protrusions shall not exceed 0.010 inch.
5. “E” and “eA” measured with the leads constrained to be perpendicular to datum -c-. “eB” and “eC” are measured at the lead tips with the loads unconstrained.
6. “N” is the number of terminal positions. (N=16)
7. Pointed or rounded lead tips are preferred to ease insertion.
8. “b2” and “b3” maximum dimensions are not include dambar protrusions. Dambar protrusions shall not exceed 0.010 inch (0.25 mm).
9. Distance between leads including Dambar protrusions to be 0.005 inch minimum.
10. Datum plane -H- coincident with the bottom of lead, where lead exits body.
11. Refer to JEDEC MS-001 Variation AB.

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16 PINS, SOP, 300 MIL

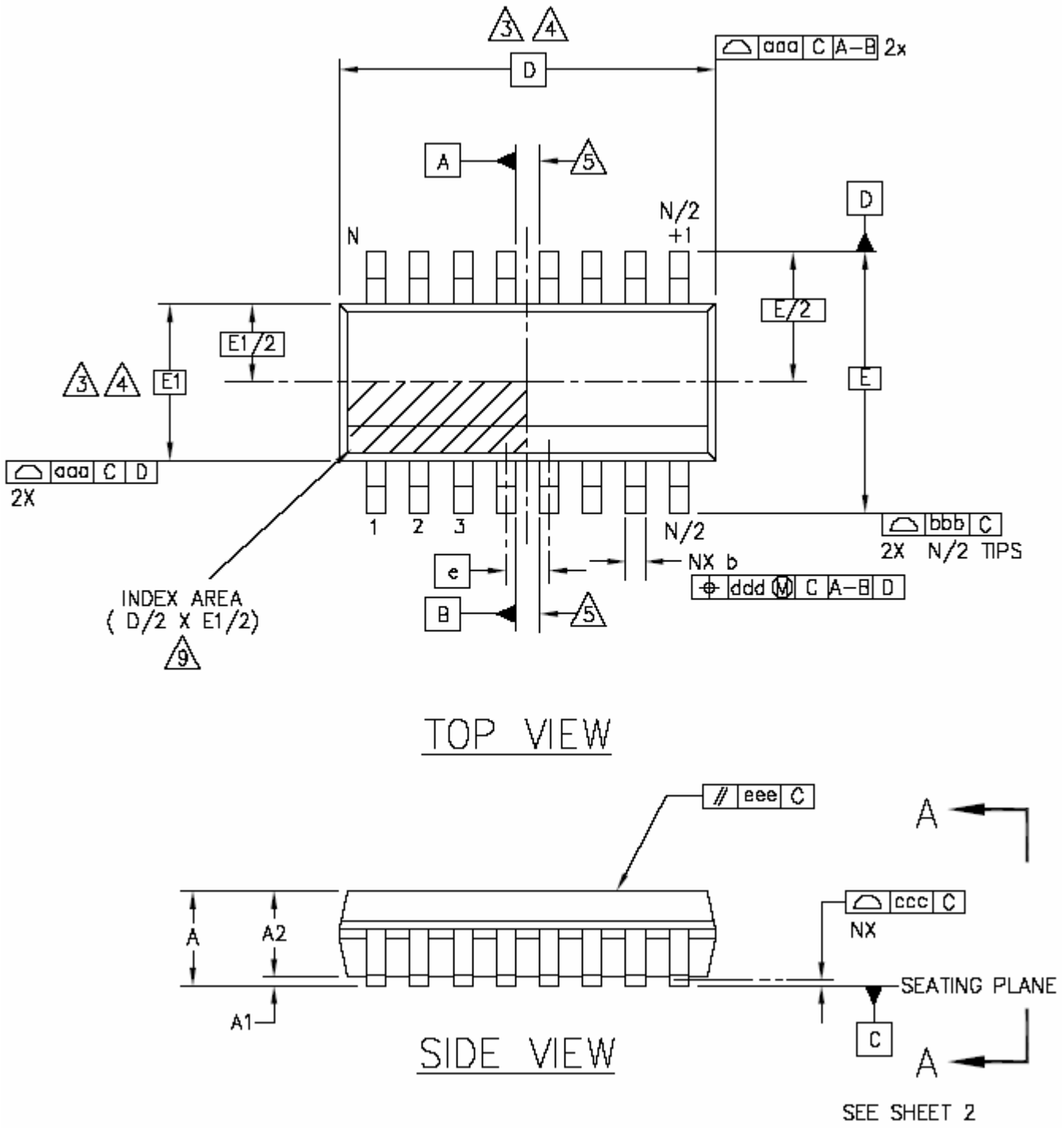


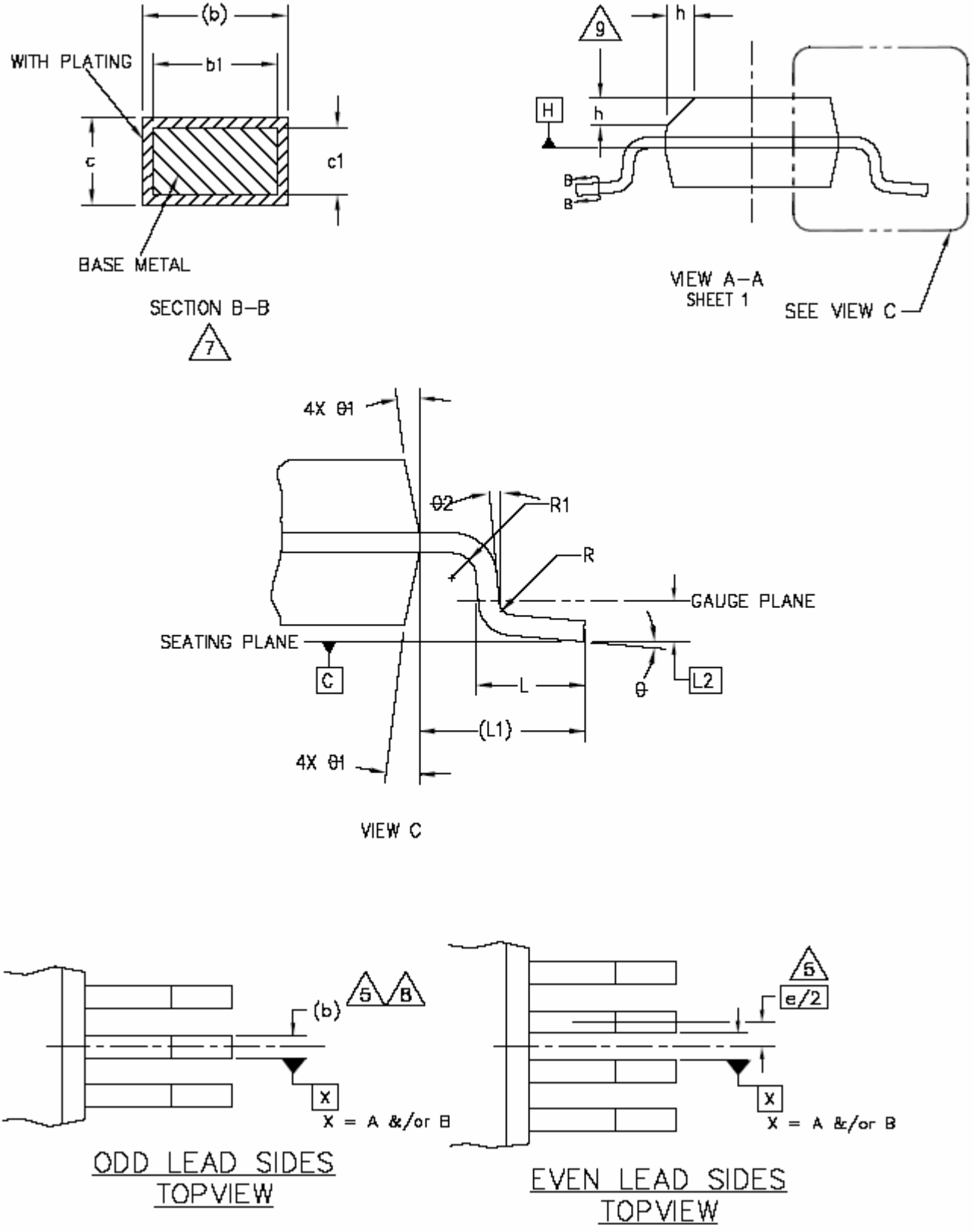
Symbol	Min.	Max
A	2.35	2.65
A1	0.10	0.30
B	0.33	0.51
C	0.23	0.32
D	10.10	10.50
E	7.40	7.60
e	1.27 BSC.	
H	10.00	10.65
h	0.25	0.75
L	0.40	1.27
α	0^o	8^o

Notes:
1. Dimensioning and tolerancing per ANSI Y14.5M-1982.
2. Dimension “D” does not include mold flash, protrusions or gate burrs. Mold Flash, protrusion or gate burrs shall not exceed 0.15 mm (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 the terminal positions (N=16)
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 AA.

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16 PINS, SOP, 150MIL




(b)
WITH PLATING
b1
c
c1
BASE METAL
SECTION B–B
7
g
h
H
h
B
B
VIEW A–A
SHEET 1
SEE VIEW C
4X θ1
θ2
R1
R
GAUGE PLANE
SEATING PLANE
C
L
θ
L2
(L1)
4X θ1
VIEW C
(b)
5
B
X
X = A &/or B
ODD LEAD SIDES
TOPVIEW
5
e/2
X
X = A &/or B
EVEN LEAD SIDES
TOPVIEW

Symbol	Min.	Typ.	Max.
A	1.35	-	1.75
A1	0.10	-	0.25
A2	1.25	-	1.65
b	0.31	-	0.51
b1	0.28	-	0.48
c	0.17	-	0.25
c1	0.17	-	0.23
D	9.90 BSC.		
E	6.00 BSC.		
E1	3.90 BSC.		
e	1.27 BSC.		
L	0.40	-	1.27
L1	1.04 REF.		
L2	0.25 BSC.		
R	0.07	-	-
R1	0.07		-
h	0.25	-	0.50
θ	0°	-	8°
θ1	5°	-	15°
θ2	0°	-	-

Note:
1. Dimensioning and tolerancing per ANSI Y 14.5M-1994
2. Controlling Dimension: MILLIMETERS.
3. Dimension D does not include mold flash protrusions or gate burrs. Mold flash, protrusions or gate burrs shall not exceed 0.15 mm (0.006 in) per end. Dimension E1 does not include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.25mm per side. D and E1 dimensions are determined at datum H.
4. The package top may be smaller than the package bottom. Dimensions D and E1 are determined at the outermost extremes of the plastic body exclusive of mold flash, tie bar burrs, gate burrs and interlead flash, but including any mismatch between the top and bottom of the plastic body.
5. Datums A & B to be determined at datum H.
6. N is the number of terminal positions. (N=8)
7. The dimensions apply to the flat section of the lead between 0.10 to 0.25mm from the lead tip.
8. Dimension “b” does not include dambar protrusion. Allowable dambar protrusion shall be 0.10mm total in excess of the “b” dimension at maximum material condition. The dambar cannot be located on the lower radius of the foot.
9. This chamfer feature is optional. If it is not present, then a pin 1 identifier must be located within the index area indicated.
10. Refer to JEDEC MS-012, Variation AC.
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