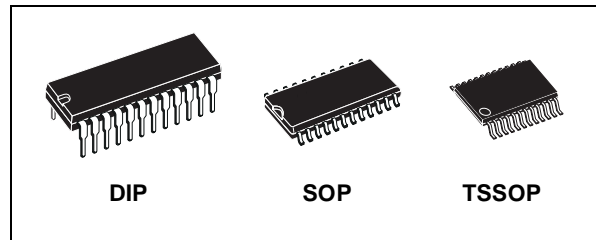




# M74HC154

## 4 TO 16 LINE DECODER/DEMULTIPLEXER

- HIGH SPEED:  
 $t_{PD} = 16\text{ns}$  (TYP.) at  $V_{CC} = 6\text{V}$
- LOW POWER DISSIPATION:  
 $I_{CC} = 4\mu\text{A}$ (MAX.) at  $T_A=25^\circ\text{C}$
- HIGH NOISE IMMUNITY:  
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$  (MIN.)
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OH}| = I_{OL} = 4\text{mA}$  (MIN)
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \cong t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE:  
 $V_{CC}$  (OPR) = 2V to 6V
- PIN AND FUNCTION COMPATIBLE WITH  
 74 SERIES 154



### ORDER CODES

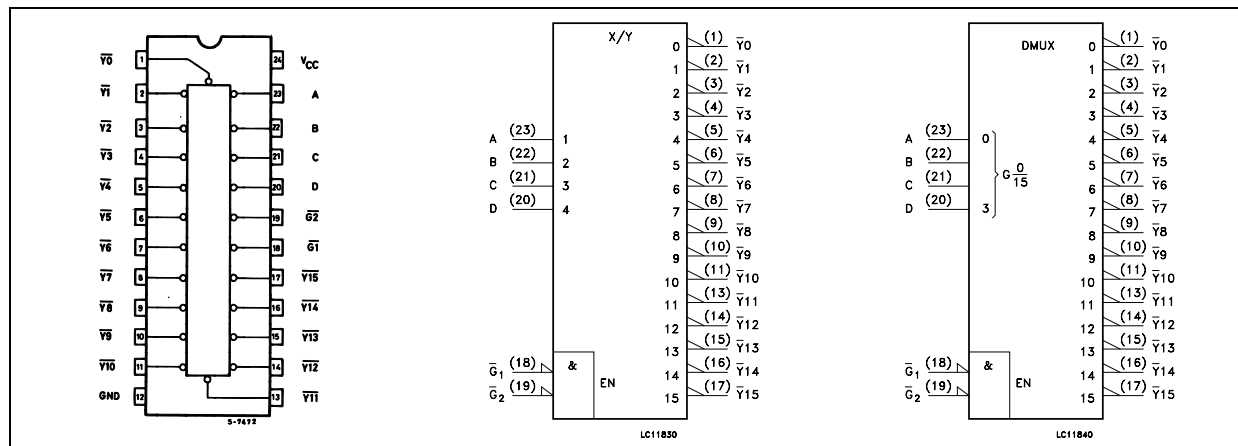
PACKAGE	TUBE	T & R
DIP	M74HC154B1R	
SOP	M74HC154M1R	M74HC154RM13TR
TSSOP		M74HC154TTR

### DESCRIPTION

The M74HC154 is an high speed CMOS 4 TO 16 LINE DECODER/DEMULTIPLEXER fabricated with silicon gate C<sup>2</sup>MOS technology. A binary code applied to the four inputs (A to D) provides a low level at the selected one of sixteen outputs excluding the other fifteen outputs, when both the strobe inputs,  $\bar{G}_1$  and  $\bar{G}_2$ , are held low. When either strobe input is held high, the

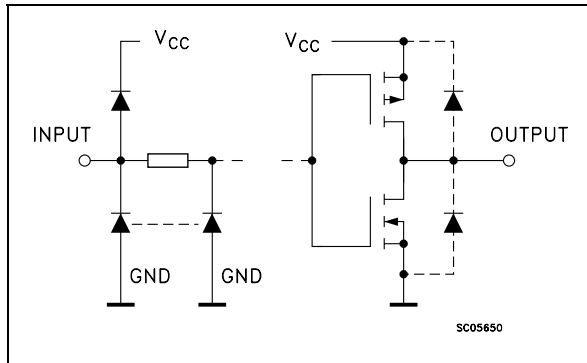
decoding function is inhibited to keep all outputs high. The strobe function makes it easy to expand the decoding lines through cascading, and simplifies the design of address decoding circuits in memory control systems. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

### PIN CONNECTION AND IEC LOGIC SYMBOLS



# M74HC154

## INPUT AND OUTPUT EQUIVALENT CIRCUIT



## PIN DESCRIPTION

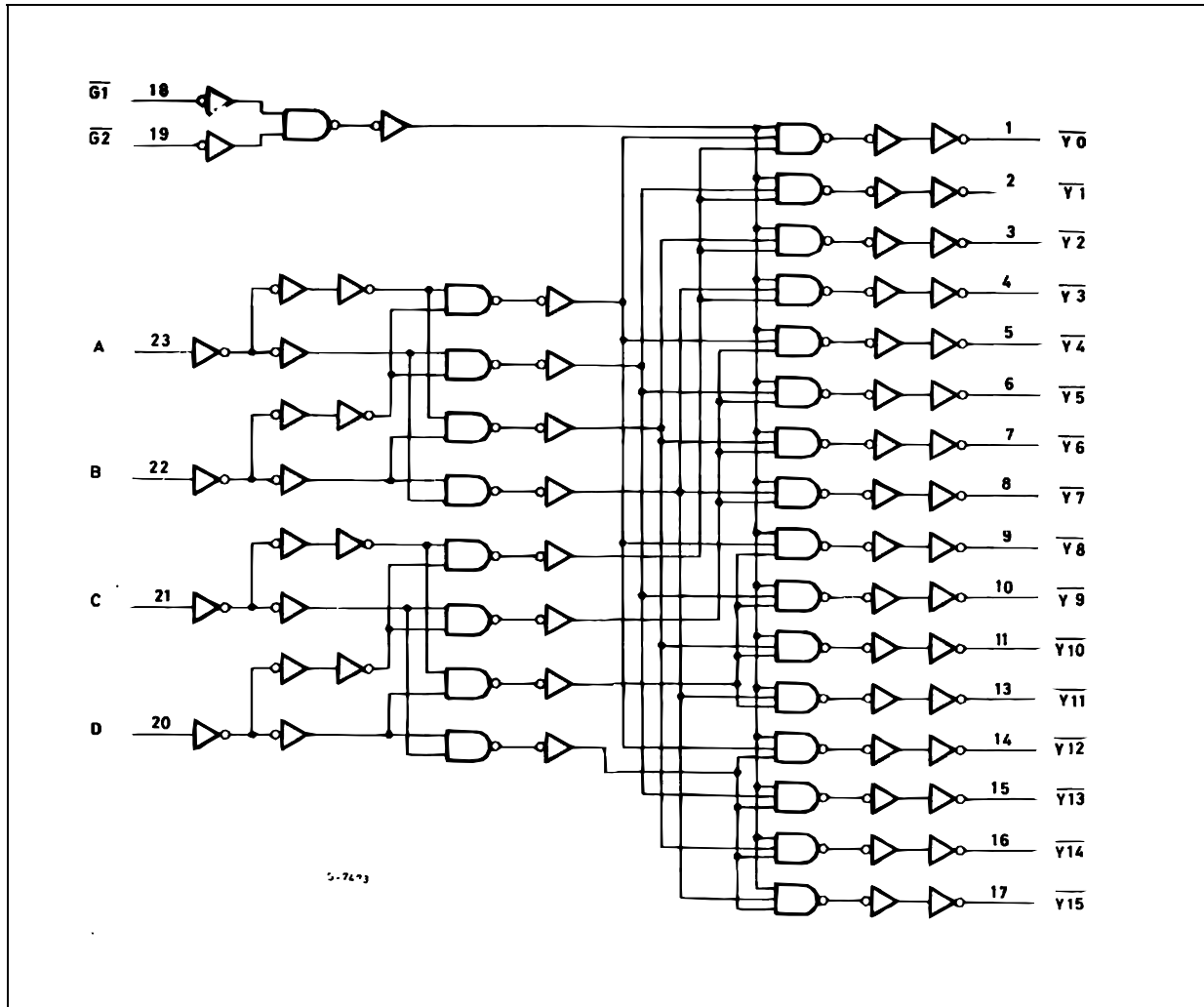
PIN No	SYMBOL	NAME AND FUNCTION
1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17	$\overline{Y0}$ to $\overline{Y15}$	Outputs (Active Low)
18, 19	$\overline{G1}$ , $\overline{G2}$	Enable Inputs (Active Low)
23, 22, 21, 20	A to D	Address Inputs
12	GND	Ground (0V)
24	$V_{CC}$	Positive Supply Voltage

## TRUTH TABLE

INPUTS						SELECTED OUTPUT (L)
$\overline{G1}$	$\overline{G2}$	D	C	B	A	
L	L	L	L	L	L	$\overline{Y0}$
L	L	L	L	L	H	$\overline{Y1}$
L	L	L	L	H	L	$\overline{Y2}$
L	L	L	L	H	H	$\overline{Y3}$
L	L	L	H	L	L	$\overline{Y4}$
L	L	L	H	L	H	$\overline{Y5}$
L	L	L	H	H	L	$\overline{Y6}$
L	L	L	H	H	H	$\overline{Y7}$
L	L	H	L	L	L	$\overline{Y8}$
L	L	H	L	L	H	$\overline{Y9}$
L	L	H	L	H	L	$\overline{Y10}$
L	L	H	L	H	H	$\overline{Y11}$
L	L	H	H	L	L	$\overline{Y12}$
L	L	H	H	L	H	$\overline{Y13}$
L	L	H	H	H	L	$\overline{Y14}$
L	L	H	H	H	H	$\overline{Y15}$
X	H	X	X	X	X	NONE
H	X	X	X	X	X	NONE

X : Don't Care

## LOGIC DIAGRAM



This logic diagram has not be used to estimate propagation delays

## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	-0.5 to +7	V
$V_I$	DC Input Voltage	-0.5 to $V_{CC} + 0.5$	V
$V_O$	DC Output Voltage	-0.5 to $V_{CC} + 0.5$	V
$I_{IK}$	DC Input Diode Current	$\pm 20$	mA
$I_{OK}$	DC Output Diode Current	$\pm 20$	mA
$I_O$	DC Output Current	$\pm 25$	mA
$I_{CC}$ or $I_{GND}$	DC $V_{CC}$ or Ground Current	$\pm 50$	mA
$P_D$	Power Dissipation	500(*)	mW
$T_{stg}$	Storage Temperature	-65 to +150	$^{\circ}C$
$T_L$	Lead Temperature (10 sec)	300	$^{\circ}C$

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied

(\*) 500mW at 65  $^{\circ}C$ ; derate to 300mW by 10mW/ $^{\circ}C$  from 65 $^{\circ}C$  to 85 $^{\circ}C$

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit	
$V_{CC}$	Supply Voltage	2 to 6	V	
$V_I$	Input Voltage	0 to $V_{CC}$	V	
$V_O$	Output Voltage	0 to $V_{CC}$	V	
$T_{op}$	Operating Temperature	-55 to 125	°C	
$t_r, t_f$	Input Rise and Fall Time	$V_{CC} = 2.0V$	0 to 1000	ns
		$V_{CC} = 4.5V$	0 to 500	ns
		$V_{CC} = 6.0V$	0 to 400	ns

## DC SPECIFICATIONS

Symbol	Parameter	Test Condition		Value						Unit	
		$V_{CC}$ (V)		$T_A = 25^\circ C$			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$V_{IH}$	High Level Input Voltage	2.0		1.5			1.5				V
		4.5		3.15			3.15				
		6.0		4.2			4.2				
$V_{IL}$	Low Level Input Voltage	2.0				0.5		0.5			V
		4.5				1.35		1.35			
		6.0				1.8		1.8			
$V_{OH}$	High Level Output Voltage	2.0	$I_O = -20 \mu A$	1.9	2.0		1.9				V
		4.5	$I_O = -20 \mu A$	4.4	4.5		4.4				
		6.0	$I_O = -20 \mu A$	5.9	6.0		5.9				
		4.5	$I_O = -4.0 mA$	4.18	4.31		4.13				
		6.0	$I_O = -5.2 mA$	5.68	5.8		5.63				
$V_{OL}$	Low Level Output Voltage	2.0	$I_O = 20 \mu A$		0.0	0.1		0.1			V
		4.5	$I_O = 20 \mu A$		0.0	0.1		0.1			
		6.0	$I_O = 20 \mu A$		0.0	0.1		0.1			
		4.5	$I_O = 4.0 mA$		0.17	0.26		0.33			
		6.0	$I_O = 5.2 mA$		0.18	0.26		0.33			
$I_I$	Input Leakage Current	6.0	$V_I = V_{CC}$ or GND			$\pm 0.1$		$\pm 1$		$\mu A$	
$I_{CC}$	Quiescent Supply Current	6.0	$V_I = V_{CC}$ or GND			4		40	80	$\mu A$	

AC ELECTRICAL CHARACTERISTICS ( $C_L = 50 \text{ pF}$ , Input  $t_r = t_f = 6 \text{ ns}$ )

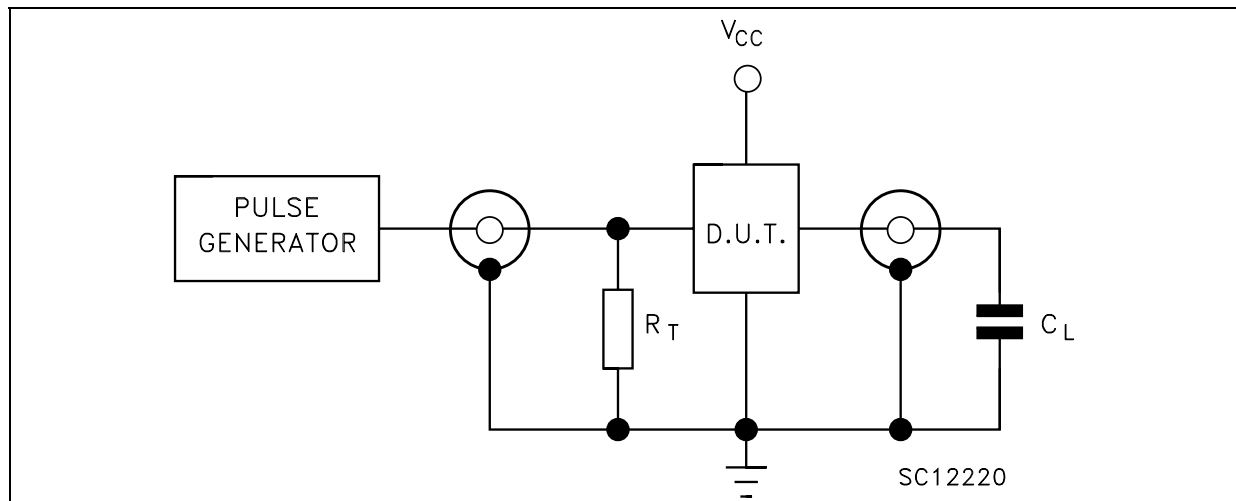
Symbol	Parameter	Test Condition		Value						Unit	
		$V_{CC}$ (V)		$T_A = 25^\circ\text{C}$			$-40 \text{ to } 85^\circ\text{C}$		$-55 \text{ to } 125^\circ\text{C}$		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$t_{TLH}$ $t_{THL}$	Output Transition Time	2.0			30	75		95		110	ns
		4.5			8	15		19		22	
		6.0			7	13		16		19	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time (A, B, C, D - $\bar{Y}$ )	2.0			65	125		155		300	ns
		4.5			19	25		31		60	
		6.0			16	21		26		51	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time ( $\overline{G1}$ , $\overline{G2}$ - Y)	2.0			55	160		200		265	ns
		4.5			17	32		40		53	
		6.0			15	27		34		45	

## CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition		Value						Unit	
		$V_{CC}$ (V)		$T_A = 25^\circ\text{C}$			$-40 \text{ to } 85^\circ\text{C}$		$-55 \text{ to } 125^\circ\text{C}$		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$C_{IN}$	Input Capacitance	5.0			5	10		10			pF
$C_{PD}$	Power Dissipation Capacitance (note 1)	5.0			57						pF

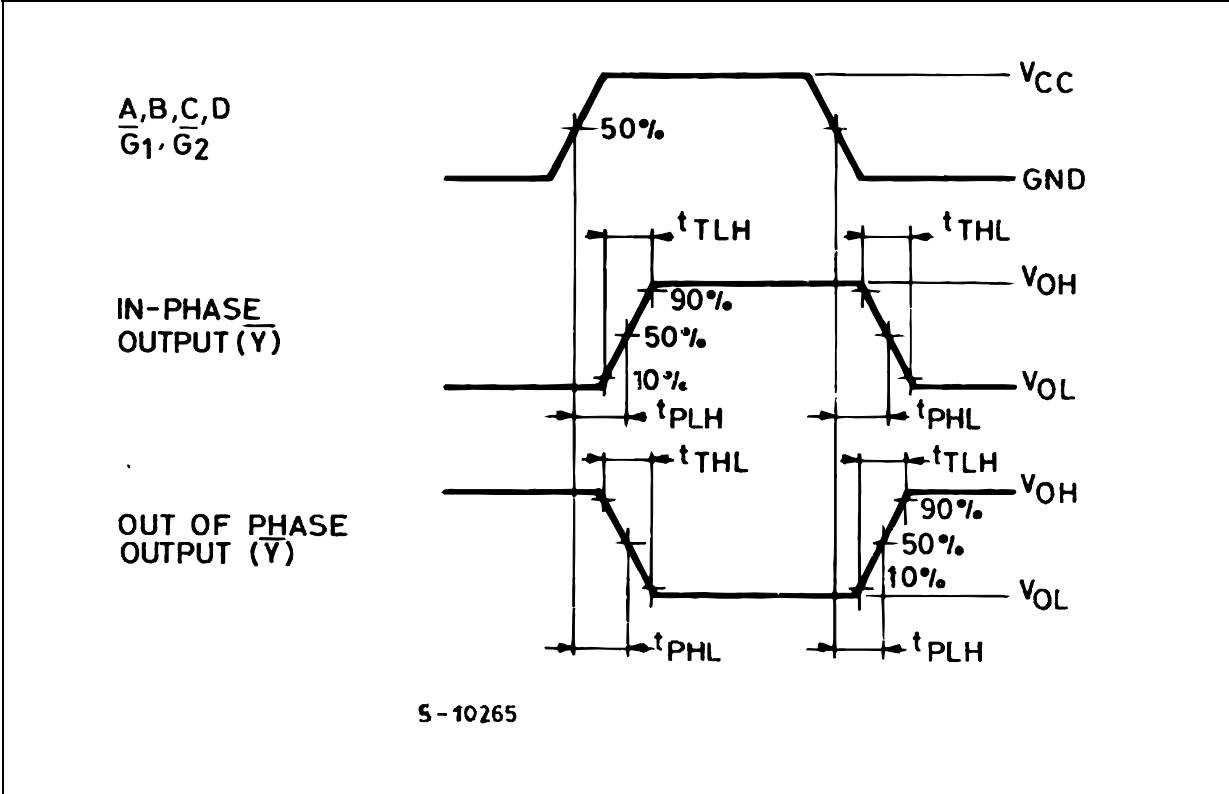
1)  $C_{PD}$  is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation.  $I_{CC(oper)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$

## TEST CIRCUIT



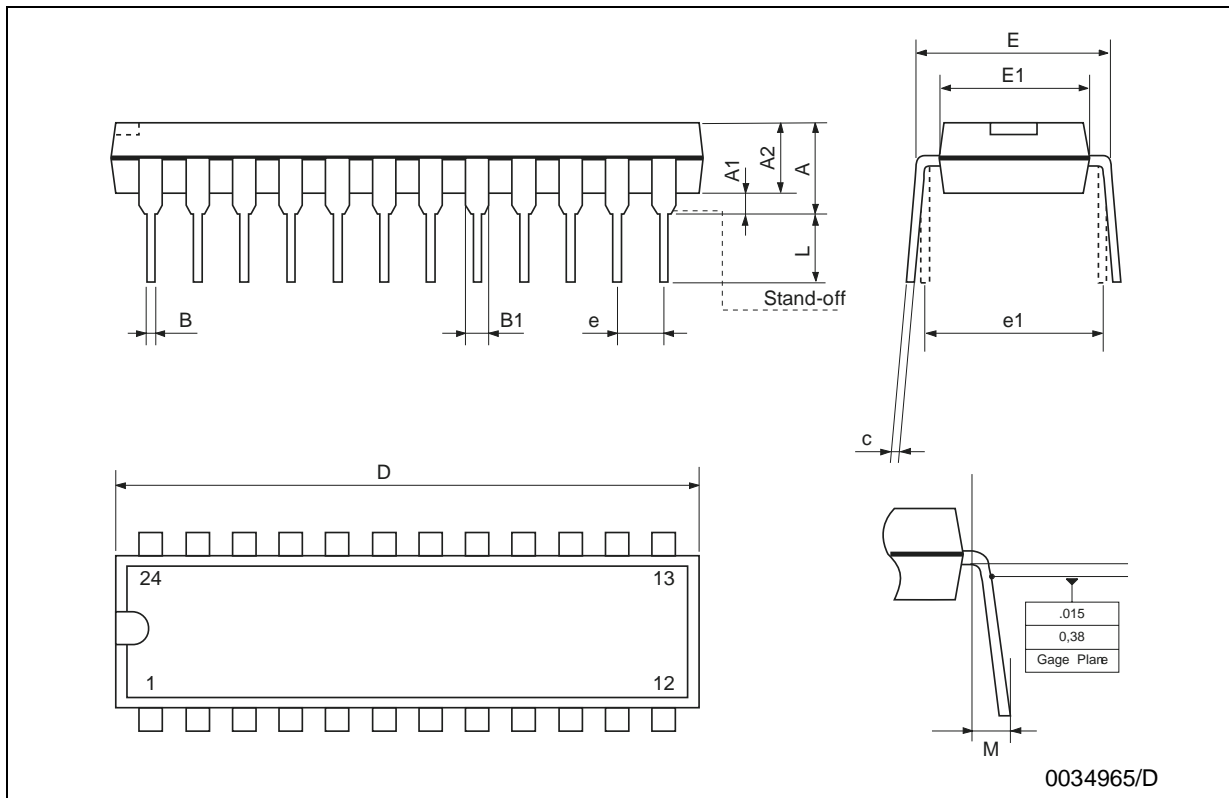
$C_L = 50 \text{ pF}$  or equivalent (includes jig and probe capacitance)  
 $R_T = Z_{OUT}$  of pulse generator (typically  $50 \Omega$ )

WAVEFORM 1: PROPAGATION DELAY TIMES (f=1MHz; 50% duty cycle)



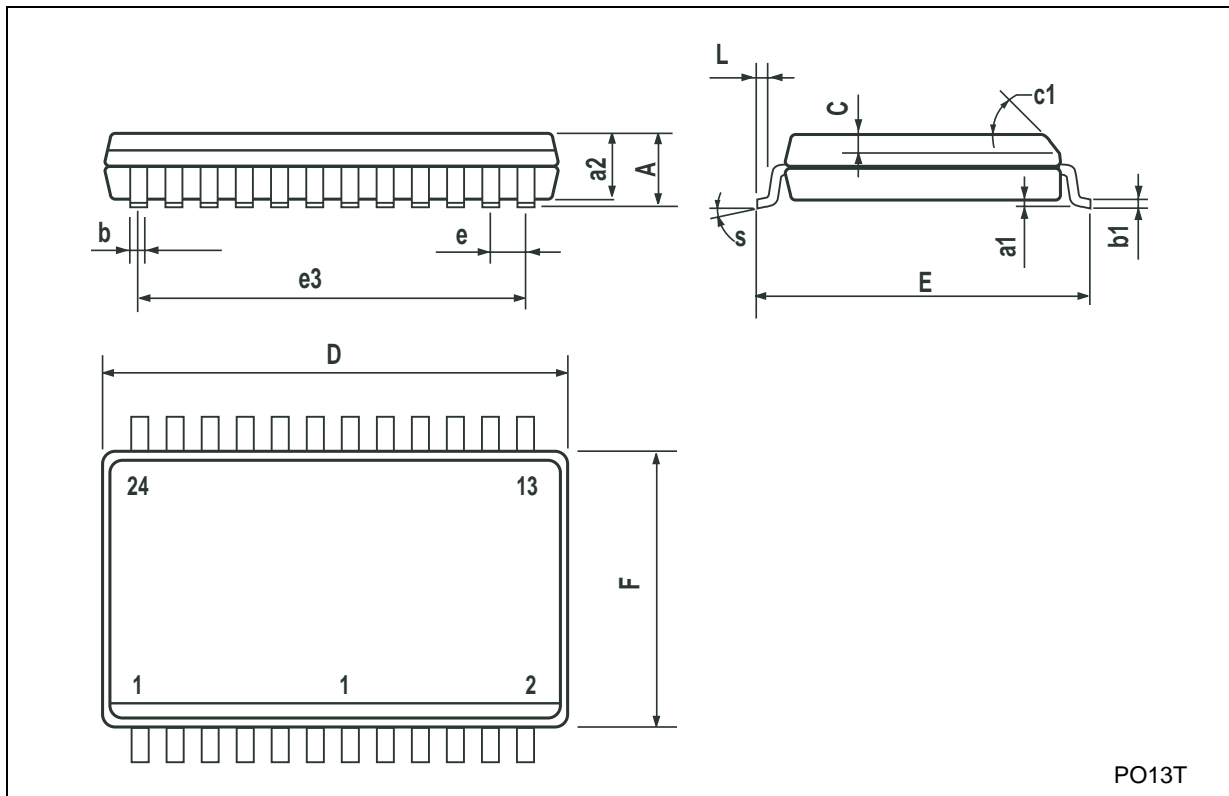
**Plastic DIP-24 (0.25) MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			4.32			0.170
A1	0.38			0.015		
A2		3.3			0.130	
B	0.41	0.46	0.51	0.016	0.018	0.020
B1	1.40	1.52	1.65	0.055	0.060	0.065
c	0.20	0.25	0.30	0.008	0.010	0.012
D	31.62	31.75	31.88	1.245	1.250	1.255
E	7.62		8.26	0.300		0.325
E1	6.35	6.60	6.86	0.250	0.260	0.270
e		2.54			0.100	
E1		7.62			0.300	
L	3.18		3.43	0.125		0.135
M	0°		15°	0°		15°



**SO-24 MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.1		0.2	0.004		0.008
a2			2.45			0.096
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.012
C		0.5			0.020	
c1	45° (typ.)					
D	15.20		15.60	0.598		0.614
E	10.00		10.65	0.393		0.419
e		1.27			0.050	
e3		13.97			0.550	
F	7.40		7.60	0.291		0.300
L	0.50		1.27	0.020		0.050
S	8° (max.)					

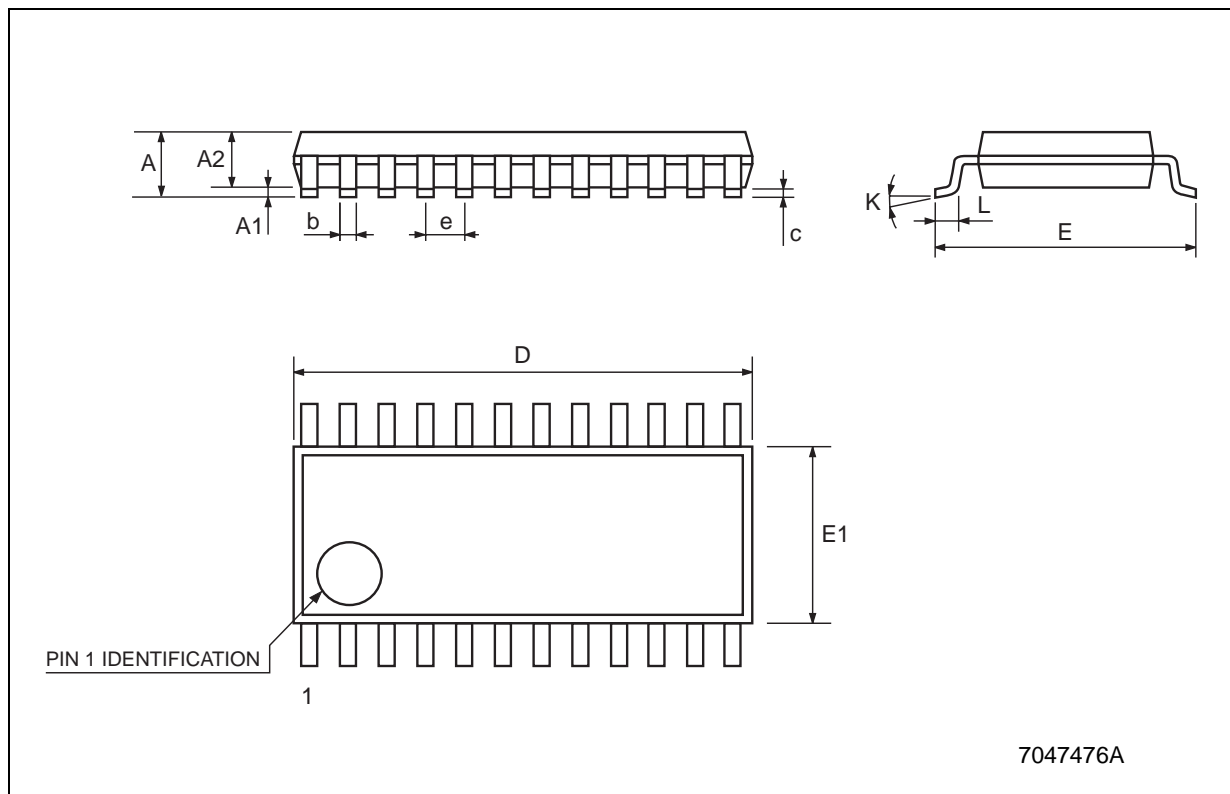


PO13T



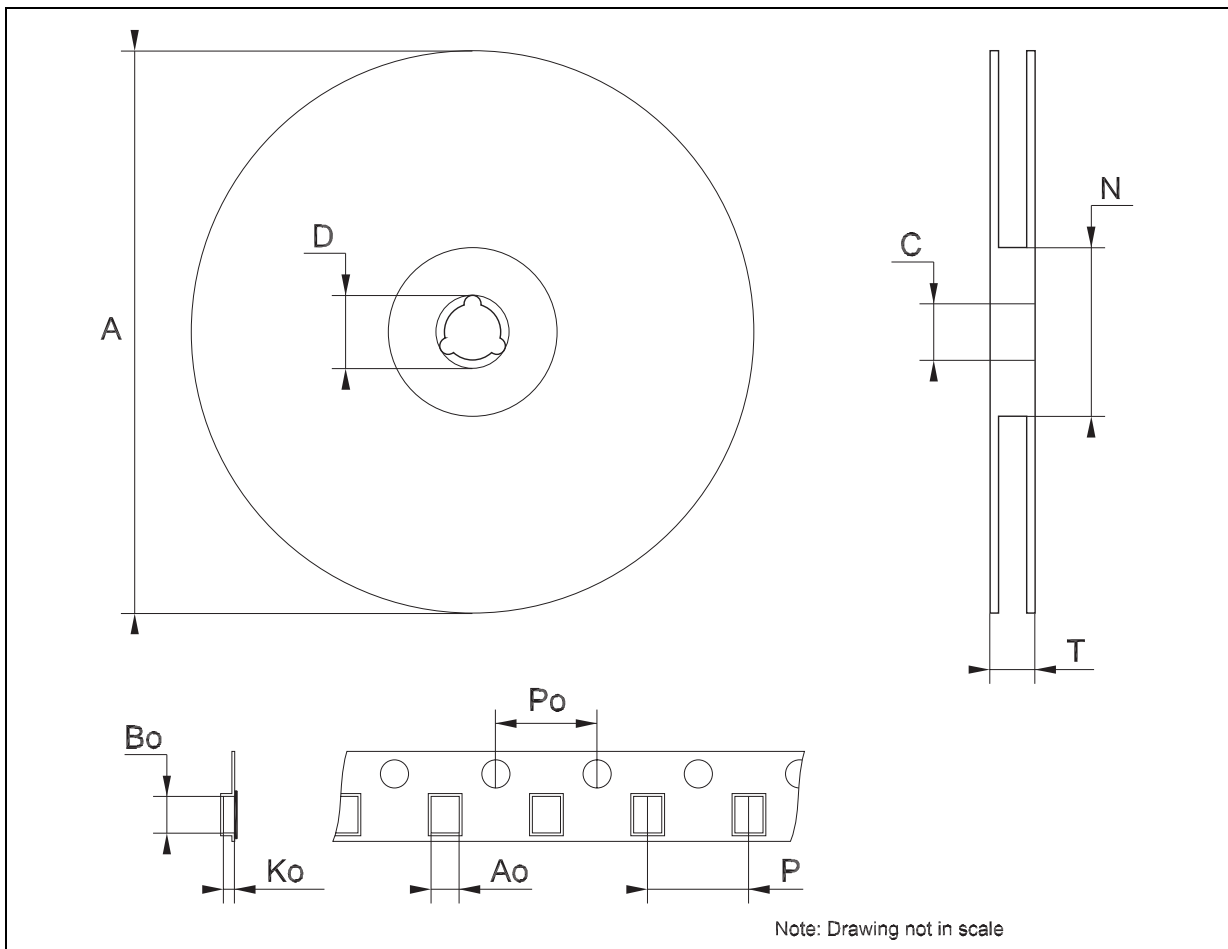
## TSSOP24 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.1			0.043
A1	0.05		0.15	0.002		0.006
A2		0.9			0.035	
b	0.19		0.30	0.0075		0.0118
c	0.09		0.20	0.0035		0.0079
D	7.7		7.9	0.303		0.311
E	6.25		6.5	0.246		0.256
E1	4.3		4.5	0.169		0.177
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.50		0.70	0.020		0.028



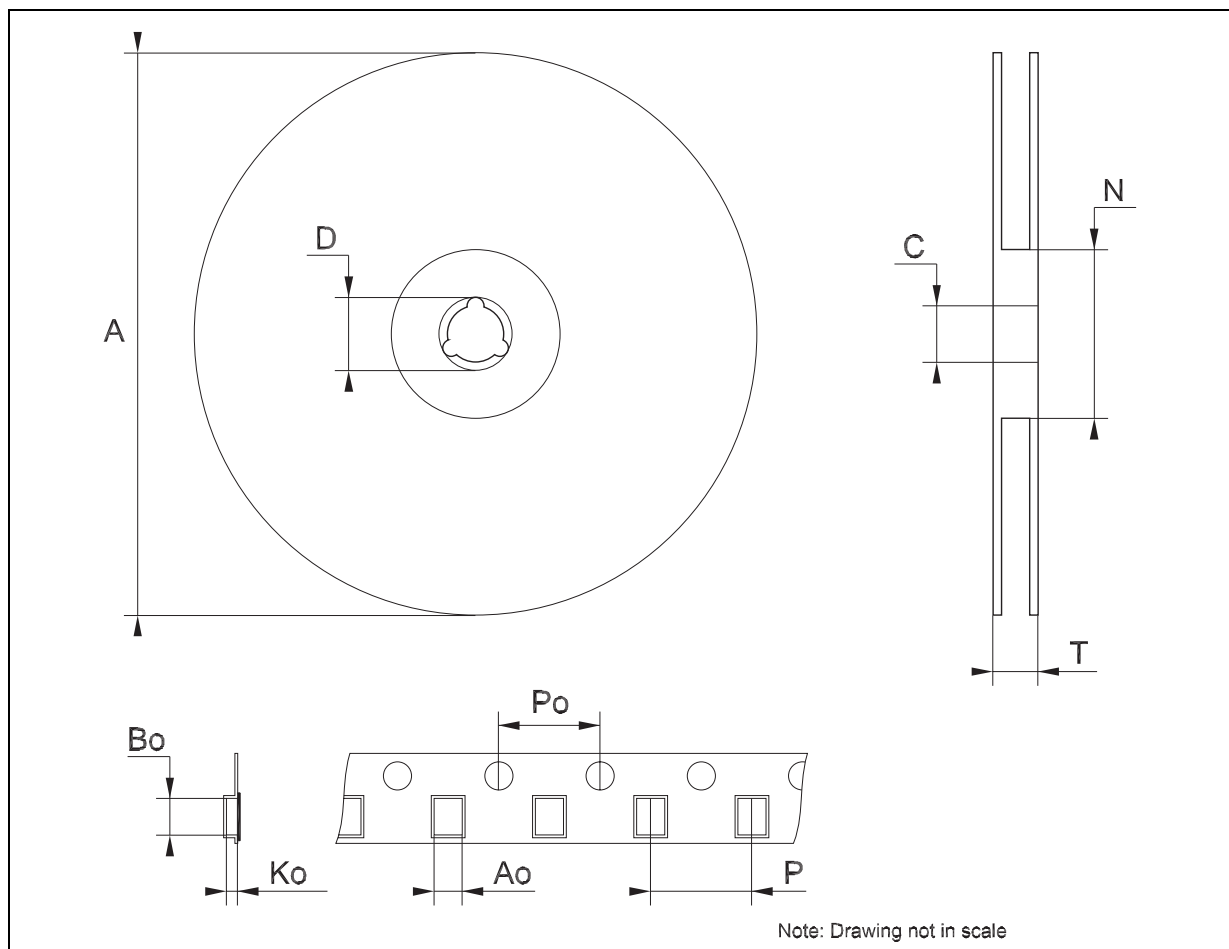
**Tape & Reel SO-24 MECHANICAL DATA**

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			30.4			1.197
Ao	10.8		11.0	0.425		0.433
Bo	15.7		15.9	0.618		0.626
Ko	2.9		3.1	0.114		0.122
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476



### Tape & Reel TSSOP24 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	6.8		7	0.268		0.276
Bo	8.2		8.4	0.323		0.331
Ko	1.7		1.9	0.067		0.075
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476



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