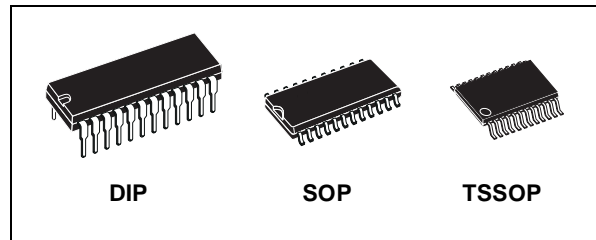# M74HC154

4 TO 16 LINE DECODER/DEMULTIPLEXER

- **HIGH SPEED:**
  t_{PD} = 16ns (TYP.) at V_{CC} = 6V
- **LOW POWER DISSIPATION:**
  I_{CC} = 4µA(MAX.) at T_A=25°C
- **HIGH NOISE IMMUNITY:**
  V_{NIH} = V_{NIL} = 28 % V_{CC} (MIN.)
- **SYMMETRICAL OUTPUT IMPEDANCE:**
  $|I_{OH}|$ = I_{OL} = 4mA (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**

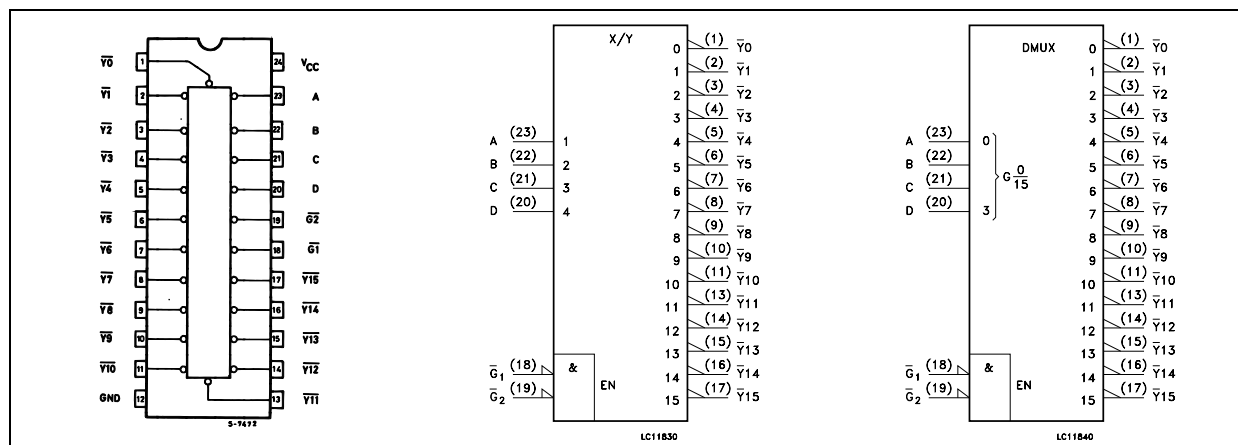**DIP**   **SOP**   **TSSOP**

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^2MOS 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, $\overline{G1}$ and $\overline{G2}$, are held low. When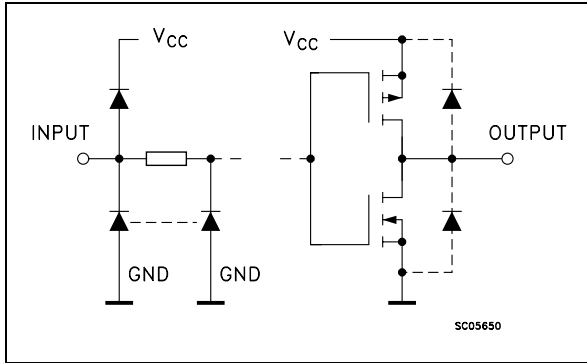 either strobe input is held high, the decoding function is inhibited to keep all outputs high. The strobe function makes it easy to expand the decoding lines through cascading, and simplifies the design of address decoding circuits in memory control systems.

All inputs are equipped with protection circuits against static discharge and transient excess voltage.

PIN CONNECTION AND IEC LOGIC SYMBOLS

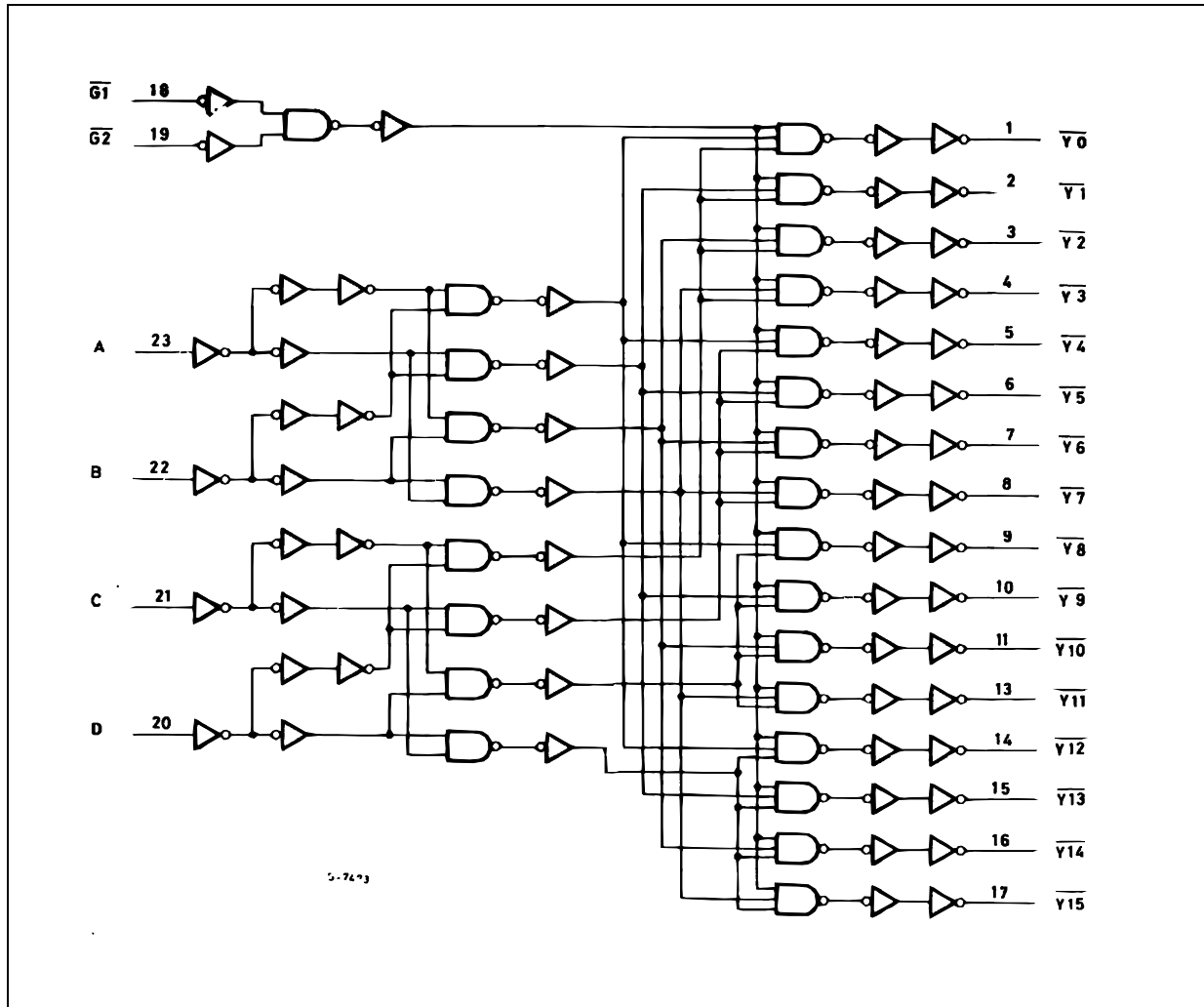## INPUT AND OUTPUT EQUIVALENT CIRCUIT

SC05650

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	± 20	mA
I_{OK}	DC Output Diode Current	± 20	mA
I_O	DC Output Current	± 25	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 50	mA
P_D	Power Dissipation	500(*)	mW
T_{stg}	Storage Temperature	-65 to +150	°C
T_L	Lead Temperature (10 sec)	300	°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 °C; derate to 300mW by 10mW/°C from 65°C to 85°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°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 µA	1.9	2.0		1.9				V
		4.5	I_O=-20 µA	4.4	4.5		4.4				
		6.0	I_O=-20 µA	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 µA		0.0	0.1		0.1			V
		4.5	I_O=20 µA		0.0	0.1		0.1			
		6.0	I_O=20 µA		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			± 0.1		± 1			µA
I_{CC}	Quiescent Supply Current	6.0	V_I = V_{CC} or GND			4		40		80	µA

AC ELECTRICAL CHARACTERISTICS (C_L = 50 pF, Input t_r = t_f = 6ns)

Symbol	Parameter	Test Condition		Value							Unit
		V_{CC} (V)		T_A = 25°C			-40 to 85°C		-55 to 125°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 - $\overline{Y}$)	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

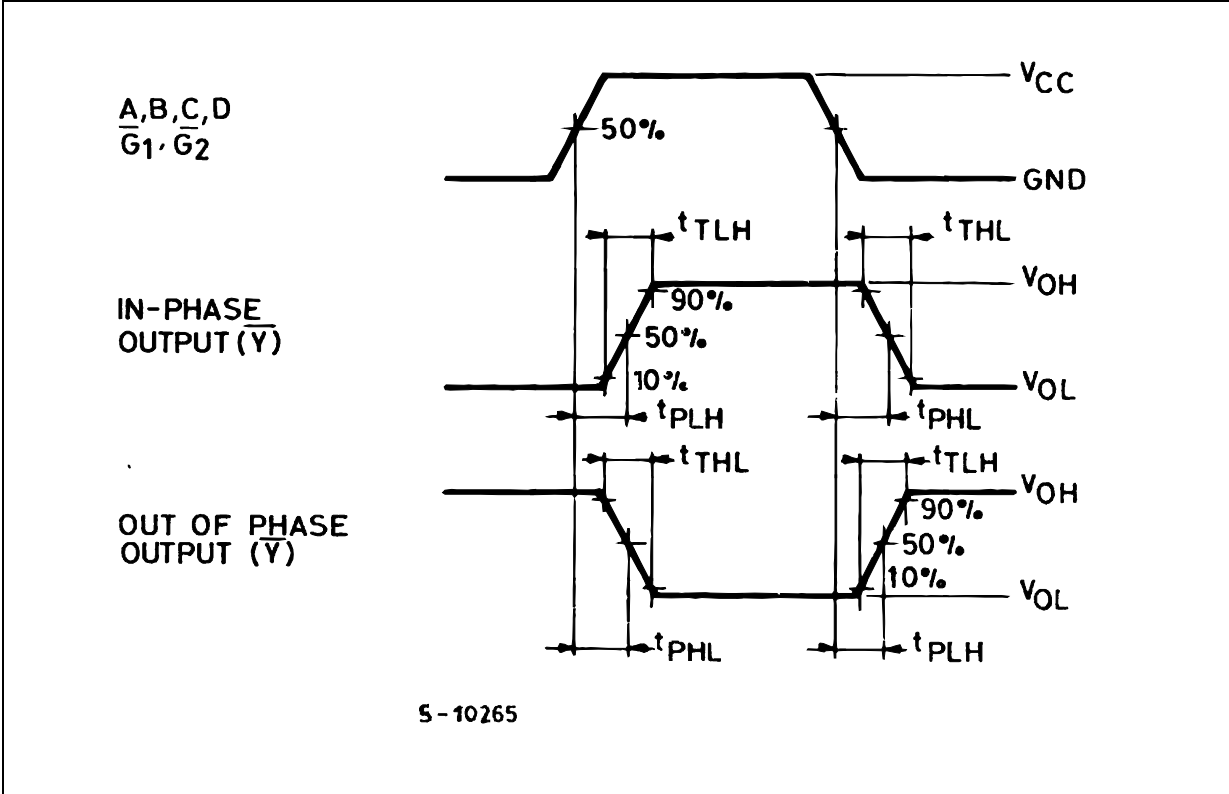| Symbol	Parameter	Test Condition		Value							Unit
		V_{CC} (V)		T_A = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
C_{IN}	Input Capacitance	5.0			5	10		10			pF
C_{PD}	Power Dissipation Capacitance (note 1)	5.0			57						pF

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. $I_{CC(opr)}$ = C_{PD} x V_{CC} x f_{IN} + I_{CC}
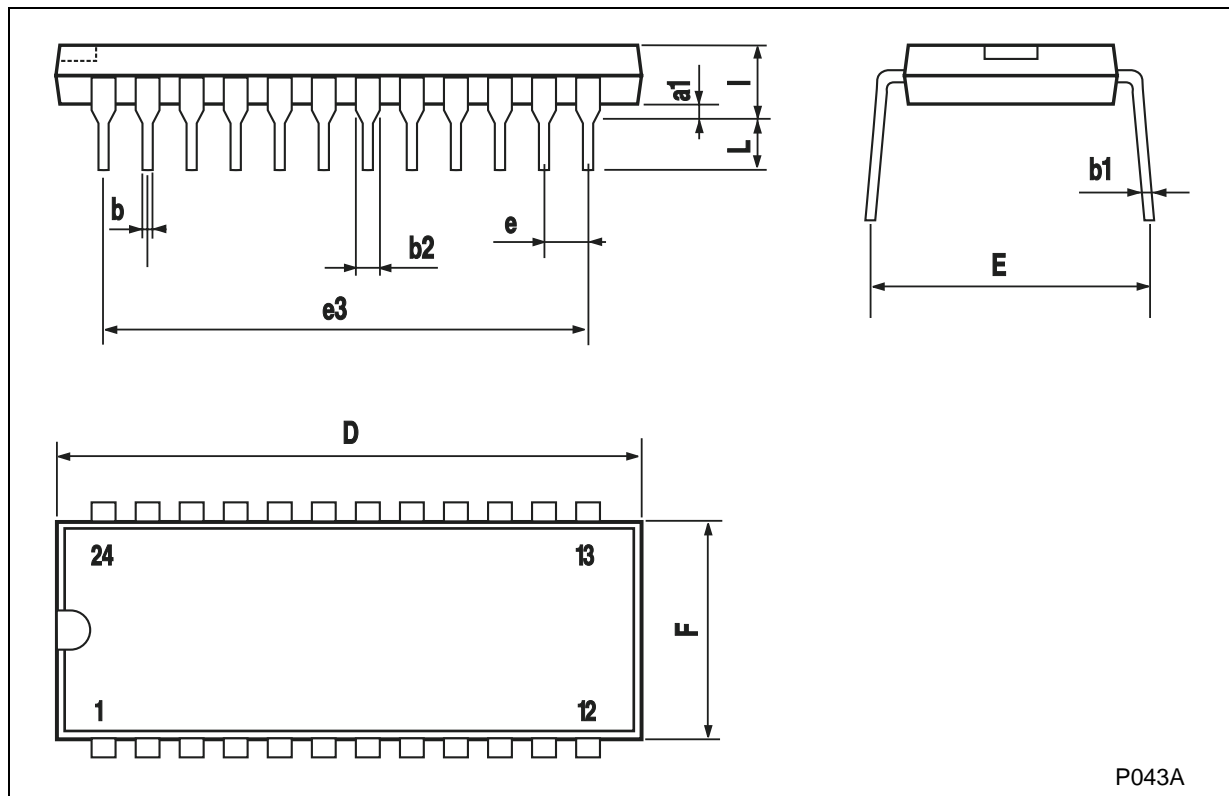
TEST CIRCUIT

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

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

S-10265
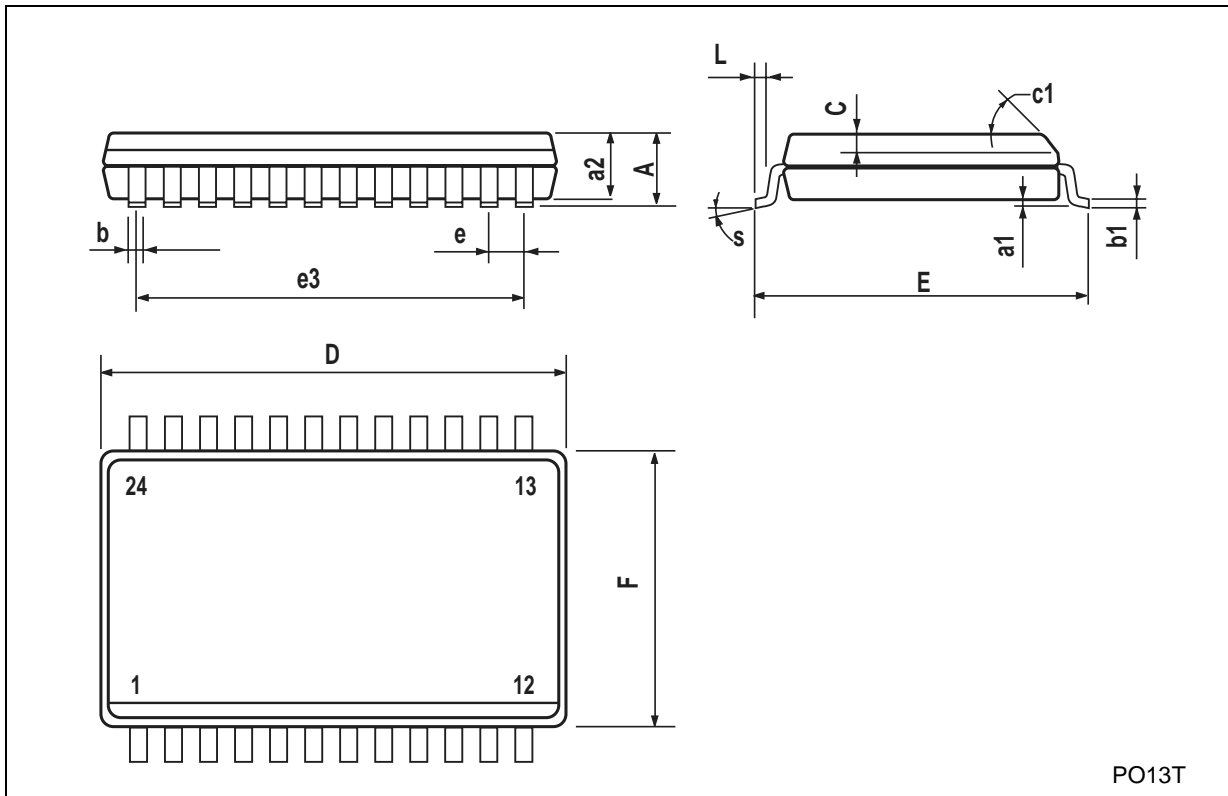
Plastic DIP-24 (0.25) MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1		0.63			0.025	
b		0.45			0.018	
b1	0.23		0.31	0.009		0.012
b2		1.27			0.500	
D			32.2			1.268
E	15.2		16.68	0.598		0.657
e		2.54			0.100	
e3		27.94			1.100	
F			14.1			0.555
I		4.445			0.175	
L		3.3			0.130	

P043A

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

PIN 1 IDENTIFICATION

7047476A