M74HCT139

DUAL 2 TO 4 DECODER/DEMULTIPLEXER

- HIGH SPEED:
  t_{PD} = 17ns (TYP.) at V_{CC} = 4.5V
- LOW POWER DISSIPATION:
  I_{CC} = 4µA(MAX.) at T_A=25°C
- COMPATIBLE WITH TTL OUTPUTS :
  V_{IH} = 2V (MIN.) V_{IL} = 0.8V (MAX)
- SYMMETRICAL OUTPUT IMPEDANCE:
  $|I_{OH}|$ = I_{OL} = 4mA (MIN)
- BALANCED PROPAGATION DELAYS:
  $t_{PLH} \cong t_{PHL}$
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 139

DESCRIPTION

The M74HCT139 is an high speed CMOS DUAL TWO LINE TO FOUR LINE DECODER/ DEMULTIPLEXER fabricated with silicon gate C^2MOS technology.

The active low enable input can be used for gating or as a data input for demultiplexing applications.

DIP   **SOP**   **TSSOP**
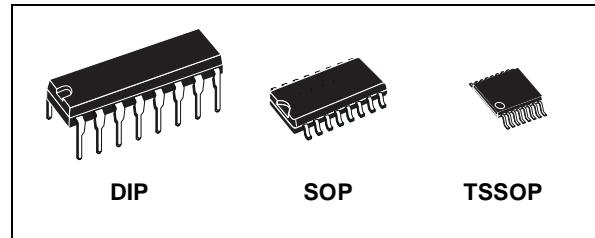
ORDER CODES

| PACKAGE	TUBE	T & R
DIP	M74HCT139B1R	
SOP	M74HCT139M1R	M74HCT139RM13TR
TSSOP		M74HCT139TTR

While the enable input is held high, all four outputs are high independently of the other inputs.
All inputs are equipped with protection circuits against static discharge and transient excess voltage.

PIN CONNECTION AND IEC LOGIC SYMBOLS
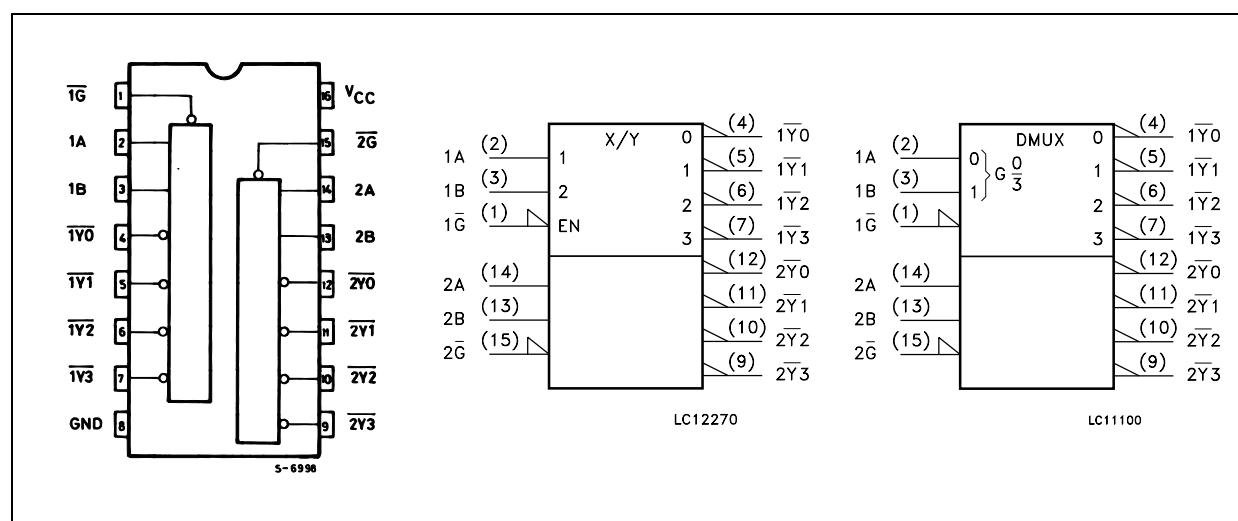
INPUT AND OUTPUT EQUIVALENT CIRCUIT

SC05650
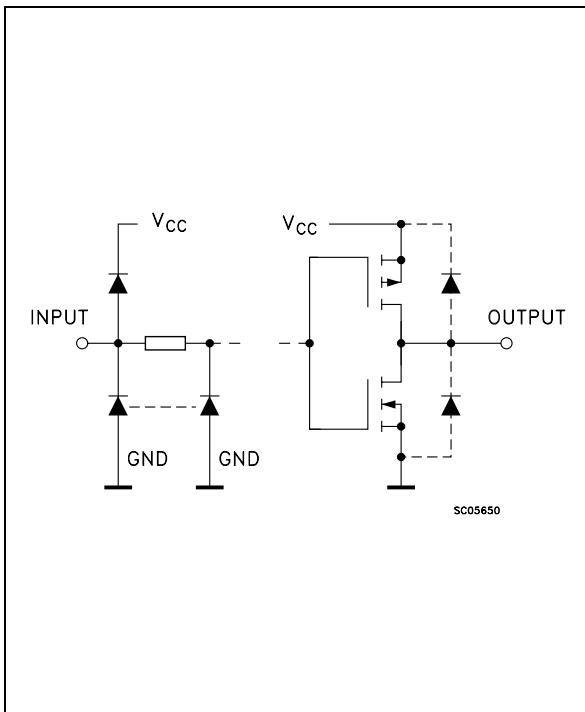
PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1, 15	1$\overline{\text{G}}$, 2$\overline{\text{G}}$	Enable Inputs
2, 3	1A, 1B	Address Inputs
4, 5, 6, 7	1$\overline{\text{Y}}_0$ TO 1$\overline{\text{Y}}_3$	Outputs
12, 11, 10, 9	2$\overline{\text{Y}}_0$ TO 2$\overline{\text{Y}}_3$	Outputs
14, 13	2A, 2B	Address Inputs
8	GND	Ground (0V)
16	V_{CC}	Positive Supply Voltage

TRUTH TABLE

INPUTS			OUTPUTS				SELECTED OUTPUT
ENABLE	SELECT		$\overline{\text{Y}}_0$	$\overline{\text{Y}}_1$	$\overline{\text{Y}}_2$	$\overline{\text{Y}}_3$	
$\overline{\text{G}}$	B	A					
H	X	X	H	H	H	H	NONE
L	L	L	L	H	H	H	$\overline{\text{Y}}_0$
L	L	H	H	L	H	H	$\overline{\text{Y}}_1$
L	H	L	H	H	L	H	$\overline{\text{Y}}_2$
L	H	H	H	H	H	L	$\overline{\text{Y}}_3$

LOGIC DIAGRAM

S-7000
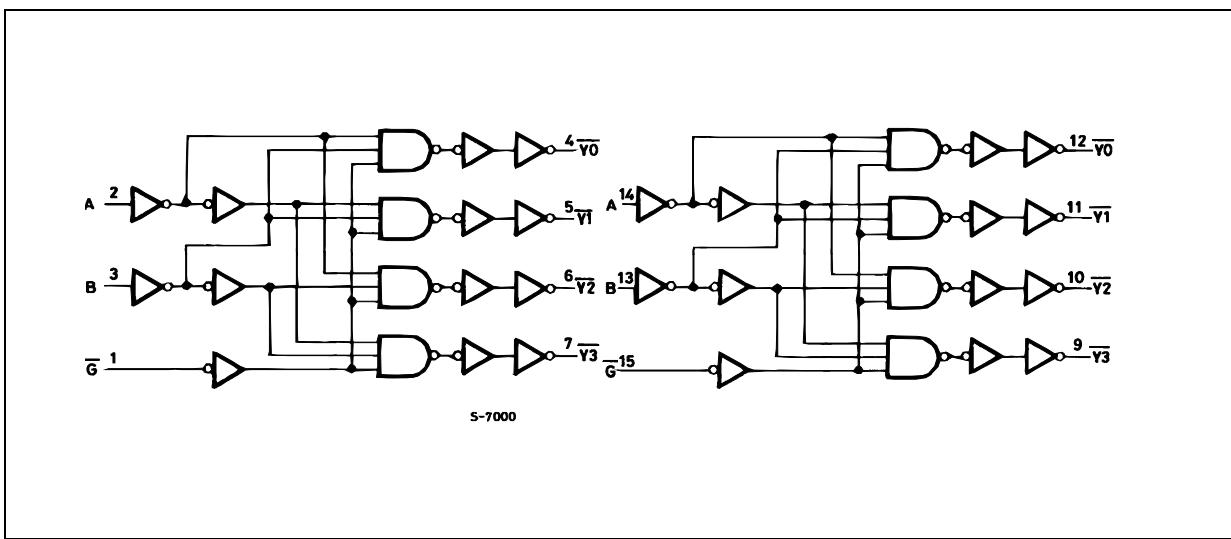
This logic diagram has not be used to estimate propagation delays

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	4.5 to 5.5	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} = 4.5 to 5.5V)	0 to 500	ns

DC SPECIFICATIONS

Symbol	Parameter	Test Condition		T_A = 25°C			-40 to 85°C		-55 to 125°C		Unit
		V_{CC} (V)		Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
V_{IH}	High Level Input Voltage	4.5 to 5.5		2.0			2.0		2.0		V
V_{IL}	Low Level Input Voltage	4.5 to 5.5				0.8		0.8		0.8	V
V_{OH}	High Level Output Voltage	4.5	I_O=-20 μA	4.4	4.5		4.4		4.4		V
			I_O=-4.0 mA	4.18	4.31		4.13		4.10		
V_{OL}	Low Level Output Voltage	4.5	I_O=20 μA		0.0	0.1		0.1		0.1	V
			I_O=4.0 mA		0.17	0.26		0.33		0.40	
I_I	Input Leakage Current	5.5	V_I = V_{CC} or GND			± 0.1		± 1		± 1	μA
I_{CC}	Quiescent Supply Current	5.5	V_I = V_{CC} or GND			4		40		80	μA
ΔI_{CC}	Additional Worst Case Supply Current	5.5	Per Input pin V_I = 0.5V or V_I = 2.4V Other Inputs at V_{CC} or GND I_O = 0			2.0		2.9		3.0	mA

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

Symbol	Parameter	Test Condition		T_A = 25°C			-40 to 85°C		-55 to 125°C		Unit
		V_{CC} (V)		Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t_{TLH} t_{THL}	Output Transition Time	4.5			8	15		19		22	ns
t_{PLH} t_{PHL}	Propagation Delay Time (A, B -Y)	4.5			19	30		38		45	ns
t_{PLH} t_{PHL}	Propagation Delay Time (G -Y)	4.5			17	27		34		41	ns

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition		T_A = 25°C			-40 to 85°C		-55 to 125°C		Unit
		V_{CC} (V)		Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
C_{IN}	Input Capacitance				5	10		10		10	pF
C_{PD}	Power Dissipation Capacitance (note 1)				40						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}/2(per decoder)

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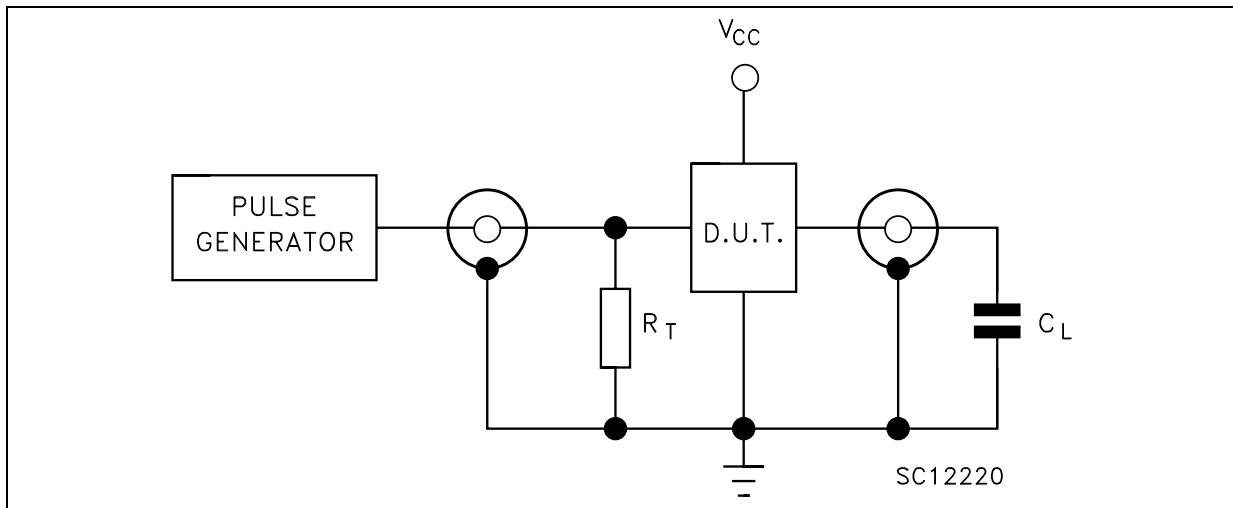
C_L = 50pF or equivalent (includes jig and probe capacitance)
R_T = Z_{OUT} of pulse generator (typically 50Ω)

WAVEFORM : PROPAGATION DELAY TIMES (f=1MHz; 50% duty cycle)
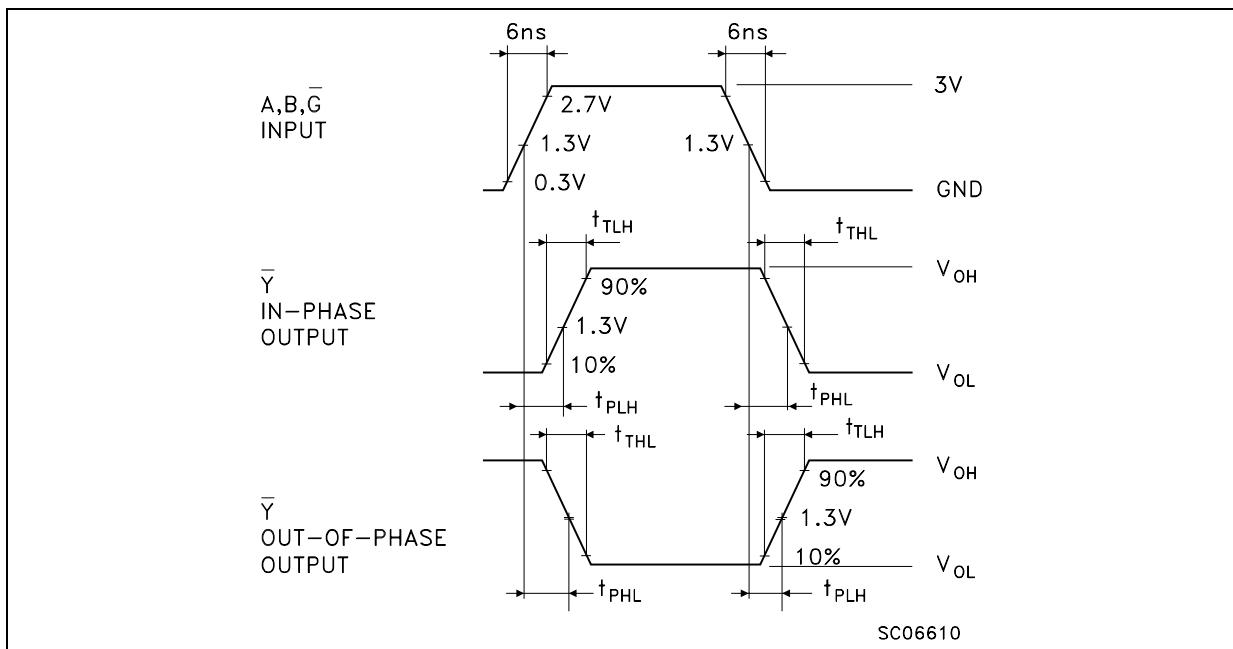
## Plastic DIP-16 (0.25) MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050

P001C
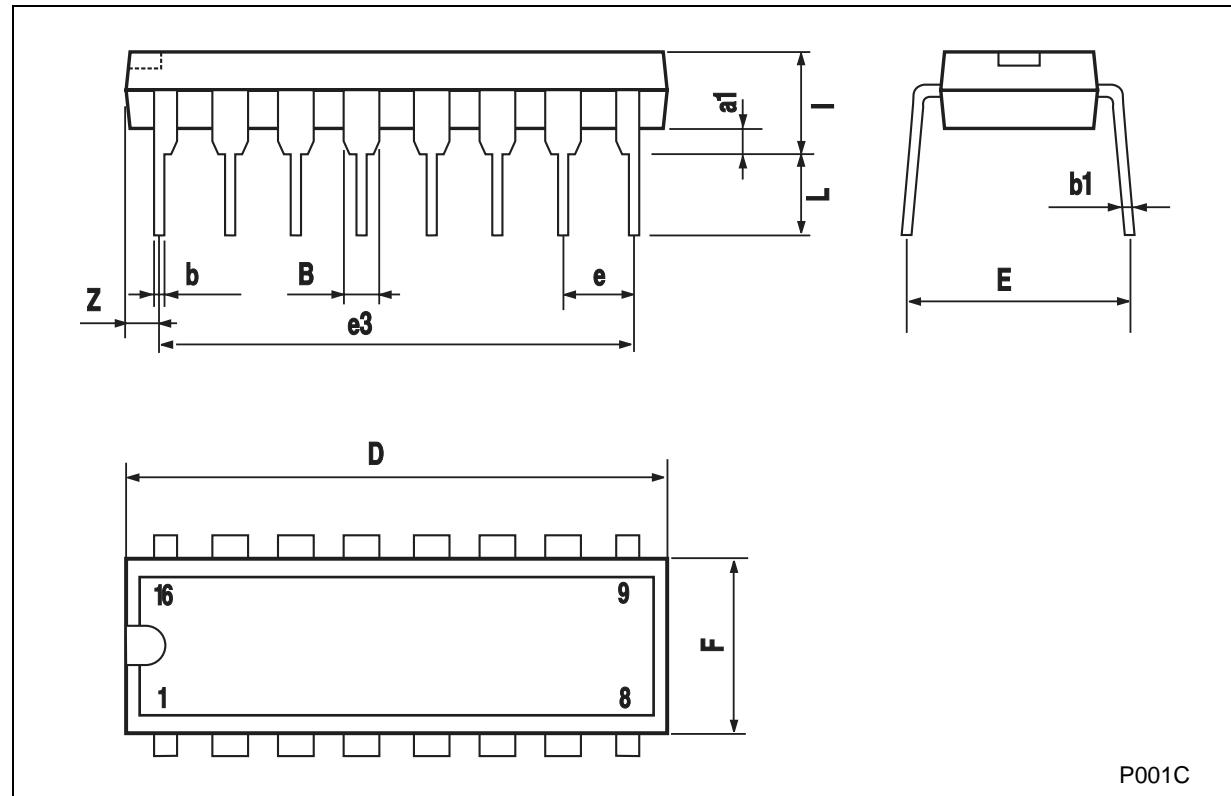
SO-16 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)					
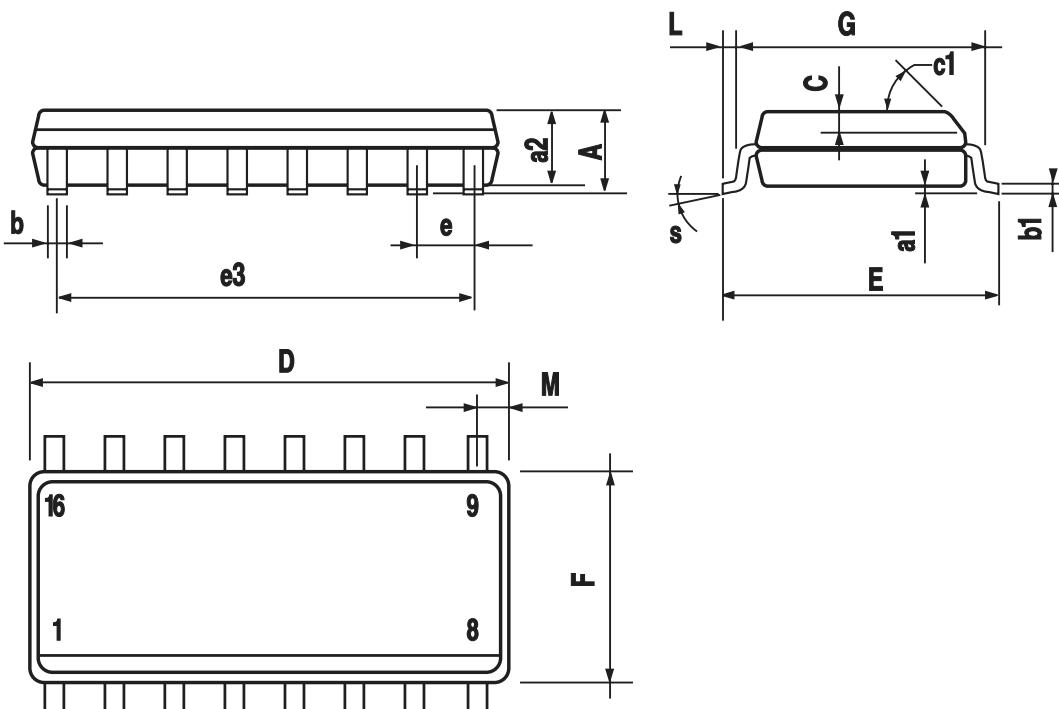
PO13H

TSSOP16 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0089
D	4.9	5	5.1	0.193	0.197	0.201
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030

PIN 1 IDENTIFICATION

0080338D