



# 74LCX14

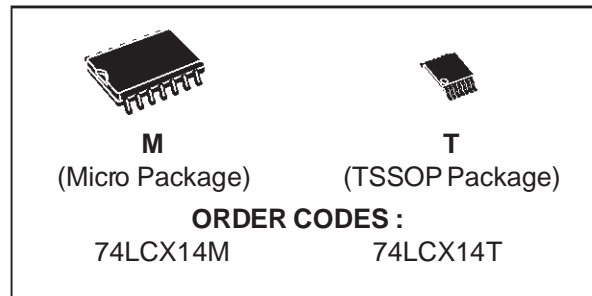
## LOW VOLTAGE CMOS HEX SCHMITT INVERTER WITH 5V TOLERANT INPUTS

- 5V TOLERANT INPUTS
- HIGH SPEED:  
 $t_{PD} = 6.5 \text{ ns (MAX.) at } V_{CC} = 3.0V$
- POWER-DOWN PROTECTION ON INPUTS AND OUTPUTS
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OH}| = I_{OL} = 24 \text{ mA (MIN)}$
- PCI BUS LEVELS GUARANTEED AT 24mA
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \cong t_{PHL}$
- OPERATING VOLTAGE RANGE:  
 $V_{CC} \text{ (OPR)} = 2.0V \text{ to } 3.6V \text{ (1.5V Data Retention)}$
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 14
- LATCH-UP PERFORMANCE EXCEEDS 500mA
- ESD PERFORMANCE:  
 $HBM > 2000V; MM > 200V$

### DESCRIPTION

The LCX14 is a low voltage CMOS HEX SCHMITT INVERTER fabricated with sub-micron silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology. It is ideal for low power and high speed 3.3V applications; it can be interfaced to 5V signal environment for inputs.

It has same speed performance at 3.3V than 5V,



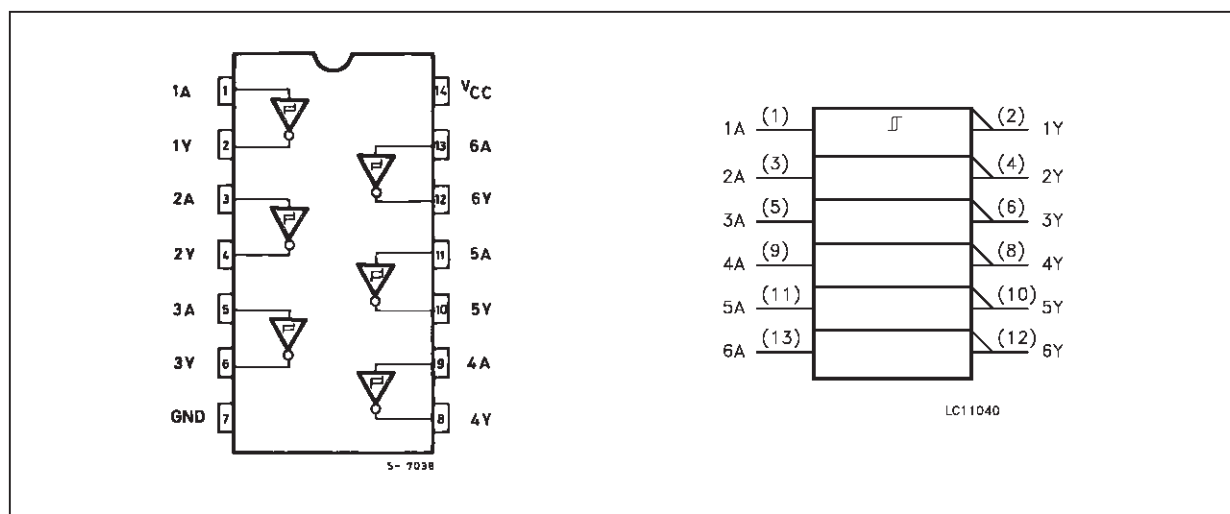
AC/ACT family, combined with a lower power consumption.

Pin configuration and function are the same as those of the LCX04 but the LCX14 has hysteresis between the positive and negative input threshold typically of 0.8V.

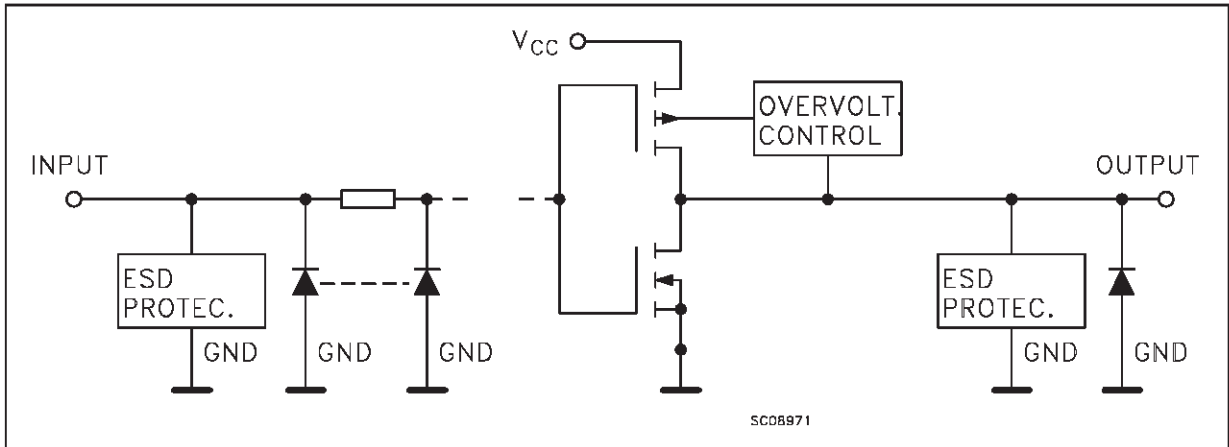
This together with its schmitt trigger function allows it to be used on line receivers with slow rise/fall input signals.

All inputs and outputs are equipped with protection circuits against static discharge, giving them 2KV ESD immunity and transient excess voltage.

### PIN CONNECTION AND IEC LOGIC SYMBOLS



INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1, 3, 5, 9, 11, 13	1A to 6A	Data Inputs
2, 4, 6, 8, 10, 12	1Y to 6Y	Data Outputs
7	GND	Ground (0V)
14	V <sub>CC</sub>	Positive Supply Voltage

TRUTH TABLE

A	Y
L	H
H	L

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	-0.5 to +7.0	V
V <sub>I</sub>	DC Input Voltage	-0.5 to +7.0	V
V <sub>O</sub>	DC Output Voltage (V <sub>CC</sub> =0V)	-0.5 to +7.0	V
V <sub>O</sub>	DC Output Voltage (High or Low State) (note1)	-0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current	- 50	mA
I <sub>OK</sub>	DC Output Diode Current (note2)	± 50	mA
I <sub>O</sub>	DC Output Source/Sink Current	± 50	mA
I <sub>CC</sub>	DC Supply Current per Supply Pin	± 100	mA
I <sub>GND</sub>	DC Ground Current per Supply Pin	± 100	mA
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C
T <sub>L</sub>	Lead Temperature (10 sec)	300	°C

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

1) I<sub>O</sub> absolute maximum rating must be observed

2) V<sub>O</sub> < GND, V<sub>O</sub> > V<sub>CC</sub>

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage (note 1)	2.0 to 3.6	V
$V_I$	Input Voltage	0 to 5.5	V
$V_O$	Output Voltage ( $V_{CC} = 0V$ )	0 to 5.5	V
$V_O$	Output Voltage (High or Low State)	0 to $V_{CC}$	V
$I_{OH}, I_{OL}$	High or Low Level Output Current ( $V_{CC} = 3.0$ to $3.6V$ )	$\pm 24$	mA
$I_{OH}, I_{OL}$	High or Low Level Output Current ( $V_{CC} = 2.7$ to $3.0V$ )	$\pm 12$	mA
$T_{op}$	Operating Temperature:	-40 to +85	$^{\circ}C$

1) Truth Table guaranteed: 1.5V to 3.6V

## DC SPECIFICATIONS

Symbol	Parameter	Test Conditions		Value		Unit
		$V_{CC}$ (V)		-40 to 85 $^{\circ}C$		
				Min.	Max.	
$V_{t+}$	Positive Input Threshold	3.0		1.2	2.2	V
$V_{t-}$	Negative Input Threshold	3.0		0.6	1.5	V
$V_H$	Hysteresis Voltage	3.0		0.4	1.2	V
$V_{OH}$	High Level Output Voltage	2.7 to 3.6	$V_I = V_{IL}$	$I_O = -100 \mu A$	$V_{CC} - 0.2$	V
		2.7		$I_O = -12 \text{ mA}$	2.2	
		3.0		$I_O = -18 \text{ mA}$	2.4	
				$I_O = -24 \text{ mA}$	2.2	
$V_{OL}$	Low Level Output Voltage	2.7 to 3.6	$V_I = V_{IH}$	$I_O = 100 \mu A$	0.2	V
		2.7		$I_O = 12 \text{ mA}$	0.4	
		3.0		$I_O = 16 \text{ mA}$	0.4	
				$I_O = 24 \text{ mA}$	0.55	
$I_I$	Input Leakage Current	2.7 to 3.6	$V_I = 0$ to $5.5 \text{ V}$		$\pm 5$	$\mu A$
$I_{off}$	Power Off Leakage Current	0	$V_I$ or $V_O = 5.5V$		100	$\mu A$
$I_{CC}$	Quiescent Supply Current	2.7 to 3.6	$V_I = V_{CC}$ or GND		10	$\mu A$
			$V_I$ or $V_O = 3.6$ to $5.5V$		$\pm 10$	
$\Delta I_{CC}$	ICC incr. per input	2.7 to 3.6	$V_{IH} = V_{CC} - 0.6V$		500	$\mu A$

## DYNAMIC SWITCHING CHARACTERISTICS

Symbol	Parameter	Test Conditions		Value			Unit
		$V_{CC}$ (V)		$T_A = 25 \text{ }^{\circ}C$			
				Min.	Typ.	Max.	
$V_{OLP}$	Dynamic Low Voltage Quiet Output (note 1)	3.3	$C_L = 50 \text{ pF}$ $V_{IL} = 0 \text{ V}$ $V_{IH} = 3.3V$		0.8		V
$V_{OLV}$					-0.8		

1) Number of outputs defined as "n". Measured with "n-1" outputs switching from HIGH to LOW or LOW to HIGH. The remaining output is measured in the LOW state.

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### AC ELECTRICAL CHARACTERISTICS ( $C_L = 50 \text{ pF}$ , $R_L = 500 \text{ } \Omega$ , Input $t_r = t_f = 2.5 \text{ ns}$ )

Symbol	Parameter	Test Condition		Value		Unit
		$V_{CC}$ (V)	Waveform	-40 to 85 °C		
				Min.	Max.	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time	2.7 3.0 to 3.6	1		6.0 6.5	ns
$t_{OSLH}$ $t_{OSHL}$	Output to Output Skew Time (note 1, 2)	3.0 to 3.6			1.0	ns

1) Skew is defined as the absolute value of the difference between the actual propagation delay for any two outputs of the same device switching in the same direction, either HIGH or LOW ( $t_{OSLH} = |t_{PLHm} - t_{PLHr}|$ ,  $t_{OSHL} = |t_{PHLm} - t_{PHLr}|$ )

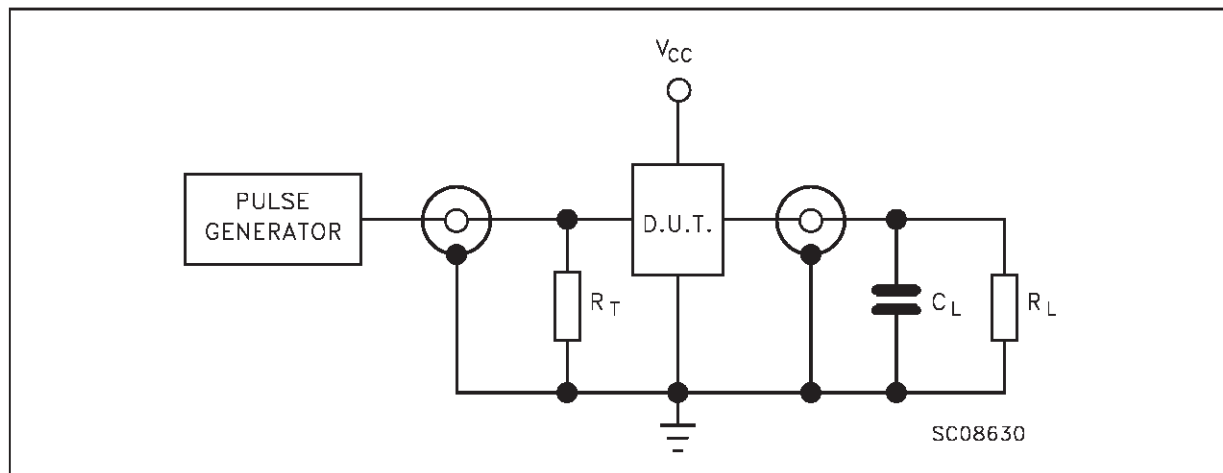
2) Parameter guaranteed by design

### CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions		Value			Unit
		$V_{CC}$ (V)		$T_A = 25 \text{ } ^\circ\text{C}$			
				Min.	Typ.	Max.	
$C_{IN}$	Input Capacitance	3.3	$V_{IN} = 0 \text{ to } V_{CC}$		6		pF
$C_{PD}$	Power Dissipation Capacitance (note 1)	3.3	$f_{IN} = 10\text{MHz}$ $V_{IN} = 0 \text{ or } V_{CC}$		48		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. Average operating current can be obtained by the following equation.  $I_{CC(oper)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/6$  (per gate)

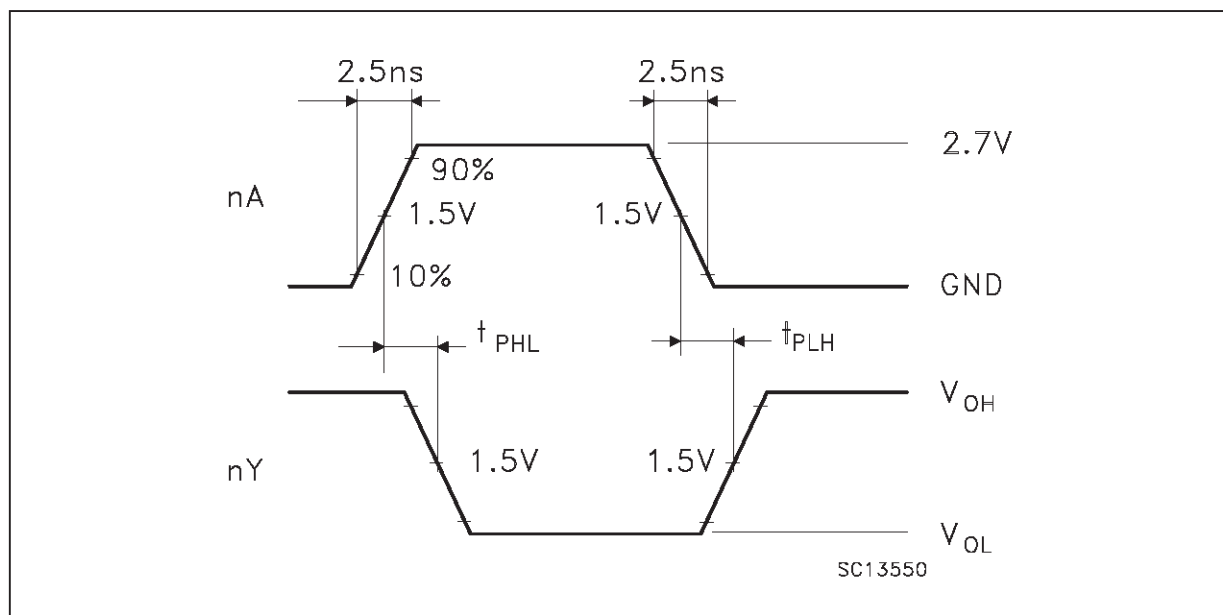
## TEST CIRCUIT



$C_L = 50 \text{ pF}$  or equivalent (includes jig and probe capacitance)

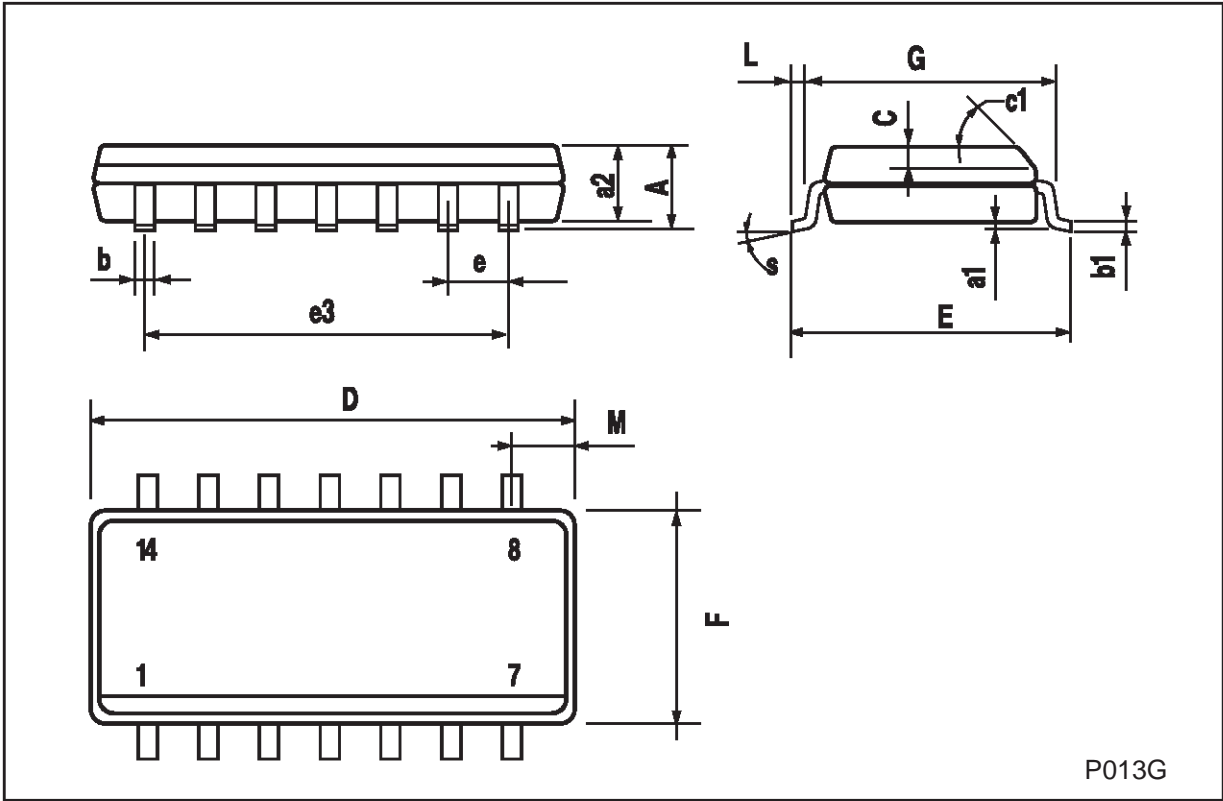
$R_L = 500\Omega$  or equivalent

$R_T = Z_{out}$  of pulse generator (typically  $50\Omega$ )

WAVEFORM: PROPAGATION DELAYS ( $f=1\text{MHz}$ ; 50% duty cycle)

**SO-14 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	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
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			0.68			0.026
S	8 (max.)					

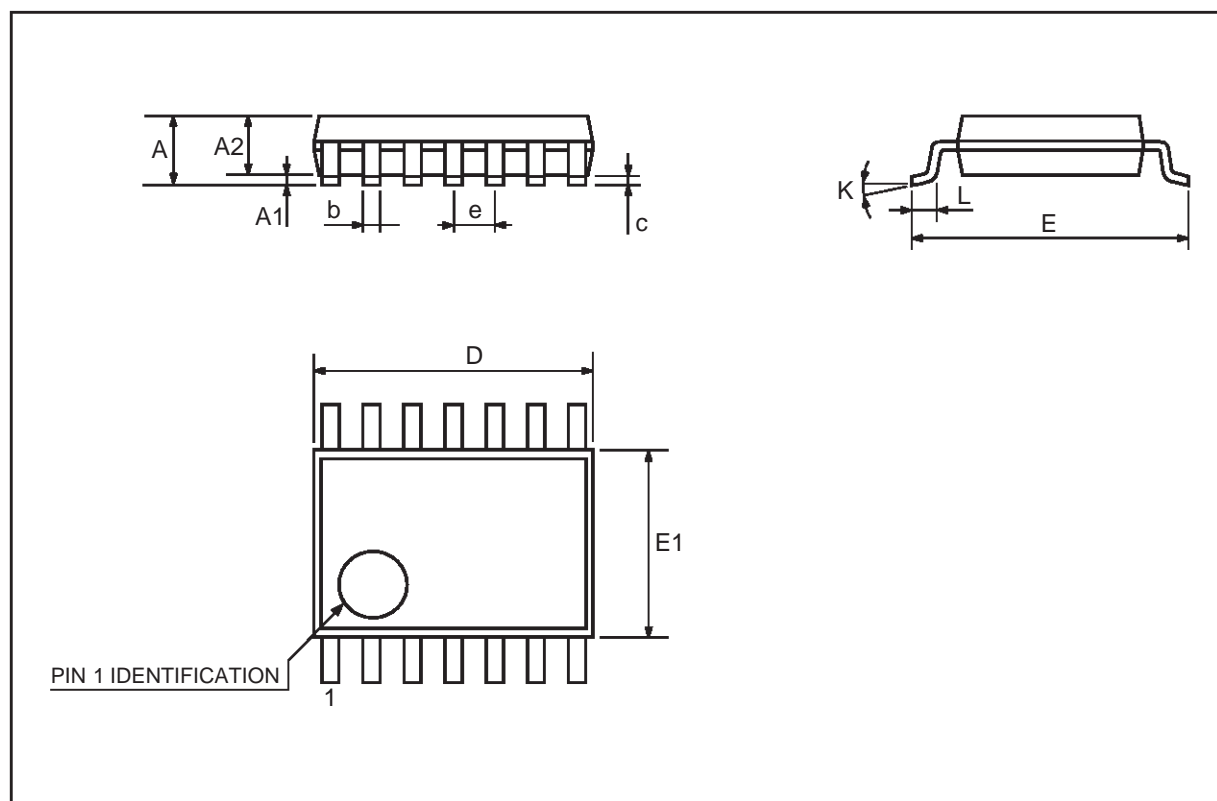


P013G



## TSSOP14 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.1			0.433
A1	0.05	0.10	0.15	0.002	0.004	0.006
A2	0.85	0.9	0.95	0.335	0.354	0.374
b	0.19		0.30	0.0075		0.0118
c	0.09		0.20	0.0035		0.0079
D	4.9	5	5.1	0.193	0.197	0.201
E	6.25	6.4	6.5	0.246	0.252	0.256
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°	4°	8°	0°	4°	8°
L	0.50	0.60	0.70	0.020	0.024	0.028



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