MC74LCX139

Advance Information

Dual Low-Voltage CMOS 2-of-4 Decoder/Demultiplexer

With 5V–Tolerant Inputs

The MC74LCX139 is a high performance, 2–of–4 decoder/ demultiplexer operating from a 2.3 to 3.6 V supply. High impedance TTL compatible inputs significantly reduce current loading to input drivers while TTL compatible outputs offer improved switching noise performance. A V_I specification of 5.5 V allows MC74LCX139 inputs to be safely driven from 5 V devices. The MC74LCX139 is suitable for memory address decoding and other TTL level bus oriented applications.

The MC74LCX139 high–speed 2–of–4 decoder/demultiplexer accepts two binary weighted inputs (A0, A1) and, when enabled, provides four mutually exclusive active–LOW outputs. The LCX139 features an active low Enable input. All outputs will be HIGH unless En is LOW. The LCX139 can be used as an 8–output demultiplexer by using one of the active–LOW Enable inputs as the data input and the other Enable input as a strobe. The Enable inputs which are not used must be permanently tied to ground.

Current drive capability is 24mA at the outputs.

- Designed for 2.7 to 3.6V V_{CC} Operation
- 5V Tolerant Inputs — Interface Capability With 5V TTL Logic
- LVTTL Compatible
- LVCMOS Compatible
- 24mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current (10μA) Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 500mA
- ESD Performance: Human Body Model >2000V; Machine Model >200V

This document contains information on a new product. Specifications and information herein are subject to change without notice.

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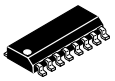
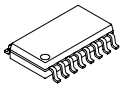


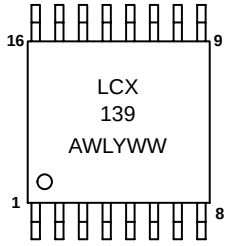
SOIC–16
D SUFFIX
CASE 751B

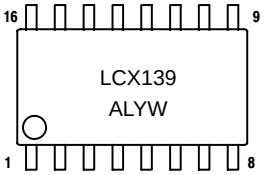
TSSOP–16
DT SUFFIX
CASE 948F



SOIC EIAJ–16
M SUFFIX
CASE 966

MARKING DIAGRAMS



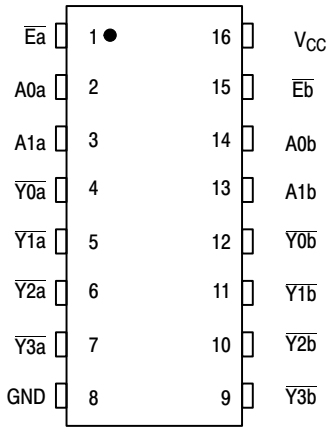


A = Assembly Location
WL = Wafer Lot
Y, YY = Year
W, WW = Work Week

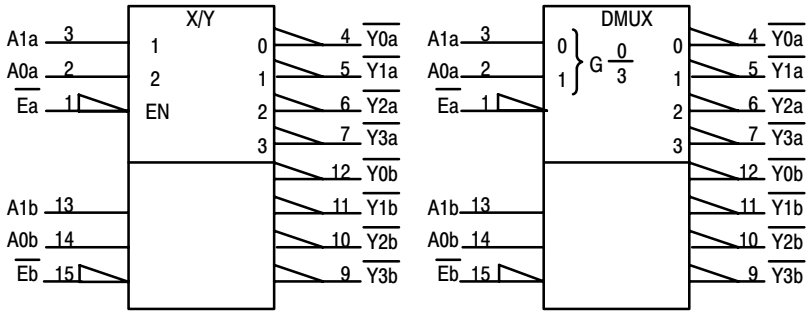
ORDERING INFORMATION

Device	Package	Shipping
MC74LCX139D	SOIC–16	48 Units/Rail
MC74LCX139DR2	SOIC–16	2500 Units/Reel
MC74LCX139DT	TSSOP–16	96 Units/Rail
MC74LCX139DTEL	TSSOP–16	2000 Units/Reel
MC74LCX139DTR2	TSSOP–16	2000 Units/Reel
MC74LCX139M	SOIC EIAJ–16	48 Units/Rail
MC74LCX139MEL	SOIC EIAJ–16	2000 Units/Reel

PIN ASSIGNMENT



IEC LOGIC DIAGRAM



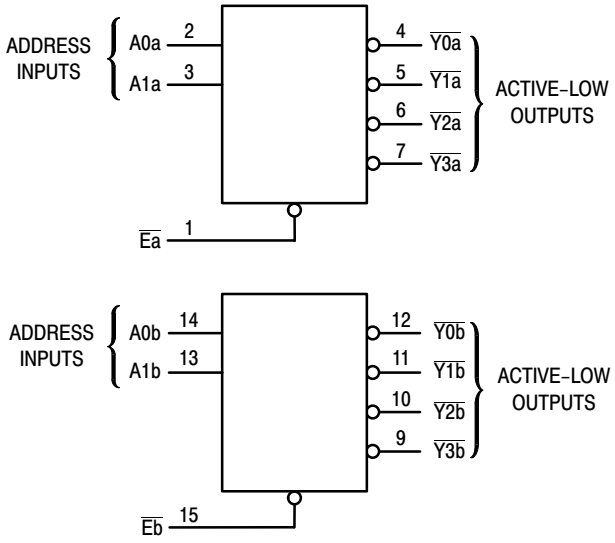
PIN NAMES

Pins	Function
A0n–A1n	Address Inputs
En	Enable Inputs
$\overline{Y0}$n–$\overline{Y3}$n	Outputs

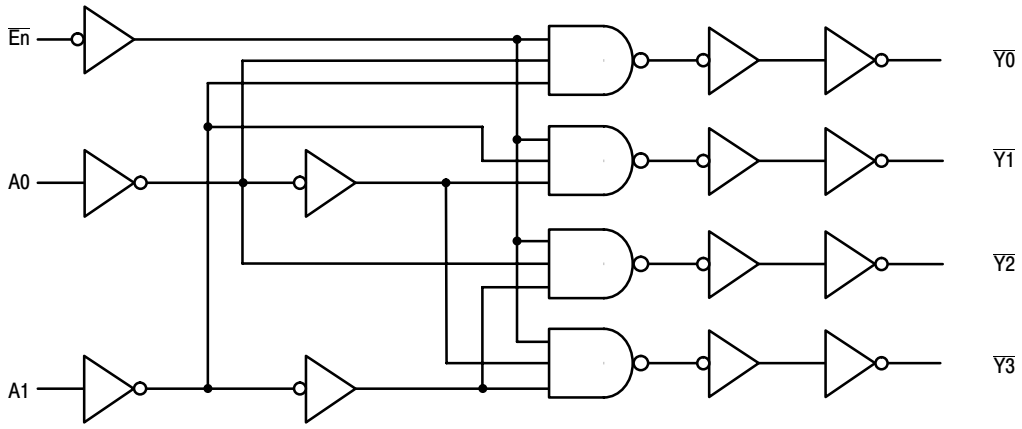
FUNCTION TABLE

Inputs			Outputs			
$\overline{E}$	A1	A0	$\overline{Y0}$	$\overline{Y1}$	$\overline{Y2}$	$\overline{Y3}$
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	L	H	H	L	H	H
L	H	L	H	H	L	H
L	H	H	H	H	H	L

LOGIC DIAGRAM



EXPANDED LOGIC DIAGRAM
(1/2 OF DEVICE)



ABSOLUTE MAXIMUM RATINGS*

Symbol	Parameter	Value	Condition	Unit
V_{CC}	DC Supply Voltage	–0.5 to +7.0		V
V_I	DC Input Voltage	$–0.5 \le V_I \le +7.0$		V
V_O	DC Output Voltage	$–0.5 \le V_O \le V_{CC} + 0.5$	Note 1.	V
I_{IK}	DC Input Diode Current	–50	$V_I < GND$	mA
I_{OK}	DC Output Diode Current	–50	$V_O < GND$	mA
		+50	$V_O > V_{CC}$	mA
I_O	DC Output Source/Sink Current	±50		mA
I_{CC}	DC Supply Current Per Supply Pin	±100		mA
I_{GND}	DC Ground Current Per Ground Pin	±100		mA
T_{STG}	Storage Temperature Range	–65 to +150		°C

* Absolute maximum continuous ratings are those values beyond which damage to the device may occur. Exposure to these conditions or conditions beyond those indicated may adversely affect device reliability. Functional operation under absolute–maximum–rated conditions is not implied.

1. Output in HIGH or LOW State. I_O absolute maximum rating must be observed.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Typ	Max	Unit
V_{CC}	Supply Voltage	Operating Data Retention Only	2.0 1.5	2.3 to 3.3	3.6 3.6	V
V_I	Input Voltage		0		5.5	V
V_O	Output Voltage	(HIGH or LOW State)	0		V_{CC}	V
I_{OH}	HIGH Level Output Current	V_{CC} = 3.0 V – 3.6 V V_{CC} = 2.7 V – 3.0 V V_{CC} = 2.3 V – 2.7 V			–24 –12 –8	mA
I_{OL}	LOW Level Output Current	V_{CC} = 3.0 V – 3.6 V V_{CC} = 2.7 V – 3.0 V V_{CC} = 2.3 V – 2.7 V			+24 +12 +8	mA
T_A	Operating Free–Air Temperature		–40		+85	°C
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate, V_{IN} from 0.8 V to 2.0 V, V_{CC} = 3.0 V		0		10	ns/V

DC ELECTRICAL CHARACTERISTICS

Symbol	Characteristic	Condition	T_A = –40°C to +85°C		Unit
			Min	Max	
V_{IH}	Minimum HIGH Level Input Voltage (Note 1.)	2.3 V ≤ V_{CC} ≤ 2.7 V 2.7 V ≤ V_{CC} ≤ 3.0 V 3.0 V ≤ V_{CC} ≤ 3.6 V	1.7 2.0 2.0		V
V_{IL}	Maximum LOW Level Input Voltage (Note 1.)	2.3 V ≤ V_{CC} ≤ 2.7 V 2.7 V ≤ V_{CC} ≤ 3.0 V 3.0 V ≤ V_{CC} ≤ 3.6 V		0.7 0.8 0.8	V
V_{OH}	Minimum HIGH Level Output Voltage	2.3 V ≤ V_{CC} ≤ 3.6 V; I_{OH} = –100 μA V_{CC} = 2.3 V; I_{OH} = –8 mA V_{CC} = 2.7 V; I_{OH} = –12 mA V_{CC} = 3.0 V; I_{OH} = –18 mA V_{CC} = 3.0 V; I_{OH} = –24 mA	V_{CC} – 0.2 1.7 2.2 2.4 2.2		V
V_{OL}	Maximm LOW Level Output Voltage	2.3 V ≤ V_{CC} ≤ 3.6 V; I_{OH} = 100 μA V_{CC} = 2.3 V; I_{OH} = 8 mA V_{CC} = 2.7 V; I_{OH} = 12 mA V_{CC} = 3.0 V; I_{OH} = 18 mA V_{CC} = 3.0 V; I_{OH} = 24 mA		0.2 0.7 0.4 0.4 0.55	V
I_I	Input Leakage Current	2.3 V ≤ V_{CC} ≤ 3.6 V; 0V ≤ V_I ≤ 5.5 V		±5.0	μA
I_{CC}	Quiescent Supply Current	2.3 V ≤ V_{CC} ≤ 3.6 V; V_I = V_{CC} or GND 2.3 V ≤ V_{CC} ≤ 3.6 V; 3.6 V ≤ V_I ≤ 5.5 V		10 ±10	μA
ΔI_{CC}	Increase in I_{CC} per Input	2.3 V ≤ V_{CC} ≤ 3.6 V; V_{IH} = V_{CC} – 0.6 V		500	μA

1. These values of V_I are used to test DC electrical characteristics only.

AC ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Limits						Unit
		T_A= –40°C to +85°C						
		V_{CC}= 3.0 V to 3.6 V		V_{CC}= 2.7 V		V_{CC}= 2.3 V to 2.7 V		
		C_L= 50 pF		C_L= 50 pF		C_L= 30pF		
		Min	Max	Min	Max	Min	Max	
t_{PLH}	Propagation Delay	0.8	6.2	1.0	7.3	0.8	9.3	ns
t_{PHL}	A to Y	0.8	6.2	1.0	7.3	0.8	9.3	ns
t_{PLH}	Propagation Delay	0.8	4.7	1.0	5.2	0.8	7.2	ns
t_{PHL}	E to Y	0.8	4.7	1.0	5.2	0.8	7.2	ns
t_{OSHL}	Output–to–Output Skew		1.0					ns
t_{OSLH}			1.0					ns

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Condition	Typical	Unit
C_{IN}	Input Capacitance	V_{CC} = 3.3 V, V_I = 0 V or V_{CC}	7	pF
C_{OUT}	Output Capacitance	V_{CC} = 3.3 V, V_I = 0 V or V_{CC}	8	pF
C_{PD}	Power Dissipation Capacitance	10MHz, V_{CC} = 3.3 V, V_I = 0V or V_{CC}	25	pF

SWITCHING WAVEFORMS

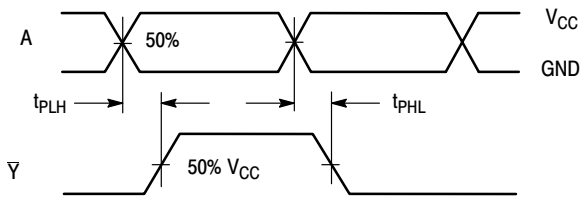


Figure 1.

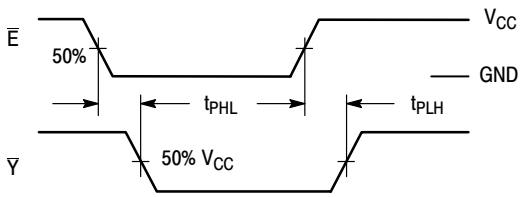
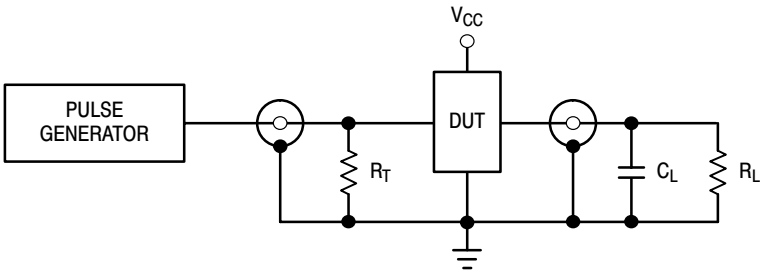


Figure 2.

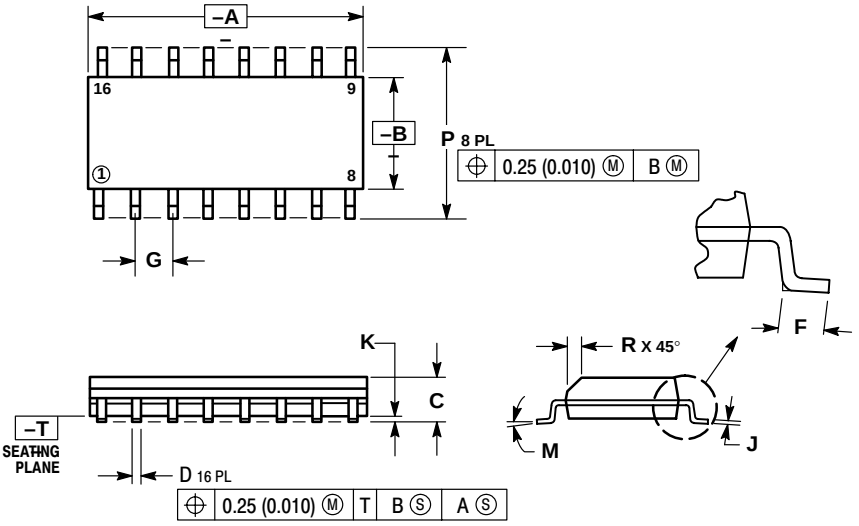


C_L = 50 pF or equivalent (Includes jig and probe capacitance)
$R_L = R_1$ = 500 Ω or equivalent
$R_T = Z_{OUT}$ of pulse generator (typically 50 Ω)

Figure 3. Test Circuit

PACKAGE DIMENSIONS

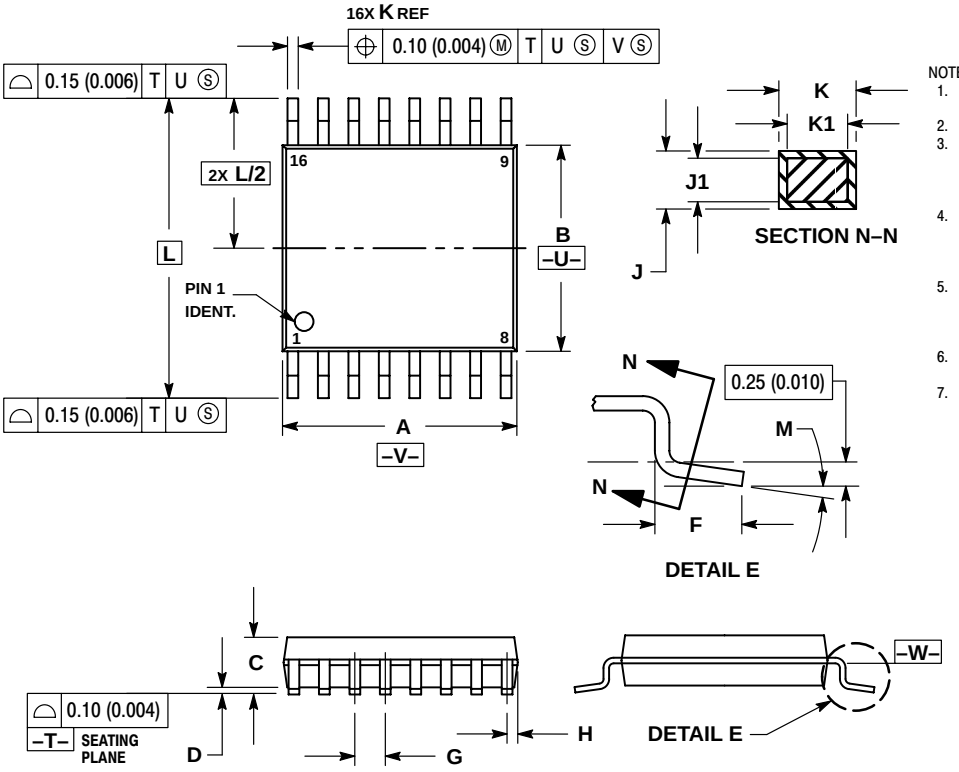
SOIC–16
D SUFFIX
CASE 751B–05
ISSUE J



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS A AND B DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
5. DIMENSION D DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.127 (0.005) TOTAL IN EXCESS OF THE D DIMENSION AT MAXIMUM MATERIAL CONDITION.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	9.80	10.00	0.386	0.393
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

TSSOP–16
DT SUFFIX
CASE 948F–01
ISSUE O

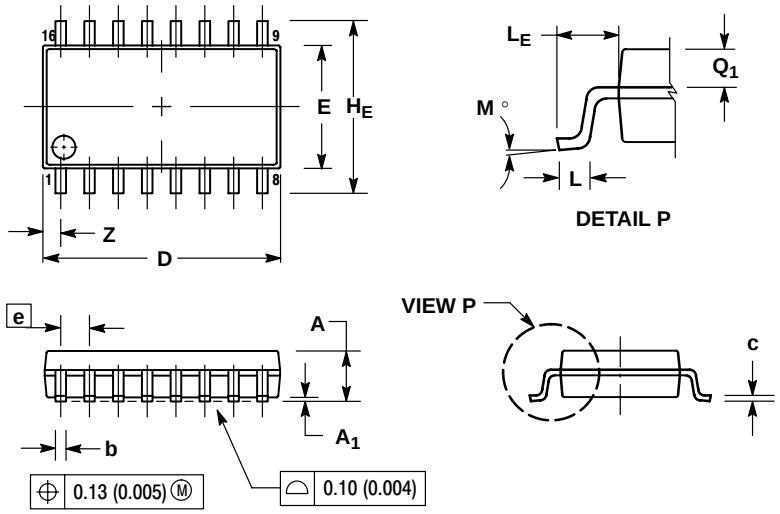


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH. PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE –W–.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	4.90	5.10	0.193	0.200
B	4.30	4.50	0.169	0.177
C	---	1.20	---	0.047
D	0.05	0.15	0.002	0.006
F	0.50	0.75	0.020	0.030
G	0.65 BSC		0.026 BSC	
H	0.18	0.28	0.007	0.011
J	0.09	0.20	0.004	0.008
J1	0.09	0.16	0.004	0.006
K	0.19	0.30	0.007	0.012
K1	0.19	0.25	0.007	0.010
L	6.40 BSC		0.252 BSC	
M	0 °	8 °	0 °	8 °

PACKAGE DIMENSIONS

SOIC EIAJ–16
M SUFFIX
CASE 966–01
ISSUE O



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS AND ARE MEASURED AT THE PARTING LINE. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
5. THE LEAD WIDTH DIMENSION (b) DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL IN EXCESS OF THE LEAD WIDTH DIMENSION AT MAXIMUM MATERIAL CONDITION. DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OR THE FOOT. MINIMUM SPACE BETWEEN PROTRUSIONS AND ADJACENT LEAD TO BE 0.46 (0.018).

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	---	2.05	---	0.081
A_1	0.05	0.20	0.002	0.008
b	0.35	0.50	0.014	0.020
c	0.18	0.27	0.007	0.011
D	9.90	10.50	0.390	0.413
E	5.10	5.45	0.201	0.215
e	1.27 BSC		0.050 BSC	
H_E	7.40	8.20	0.291	0.323
L	0.50	0.85	0.020	0.033
L_E	1.10	1.50	0.043	0.059
M	0 °	10 °	0 °	10 °
Q_1	0.70	0.90	0.028	0.035
Z	---	0.78	---	0.031

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