

# MC100EPT24

## 3.3V LVTTTL/LVCMOS to Differential LVECL Translator

### Description

The MC100EPT24 is a LVTTTL/LVCMOS to differential LVECL translator. Because LVECL levels and LVTTTL/LVCMOS levels are used, a  $-3.3\text{ V}$ ,  $+3.3\text{ V}$  and ground are required. The small outline 8-lead package and the single gate of the EPT24 makes it ideal for those applications where space, performance, and low power are at a premium.

### Features

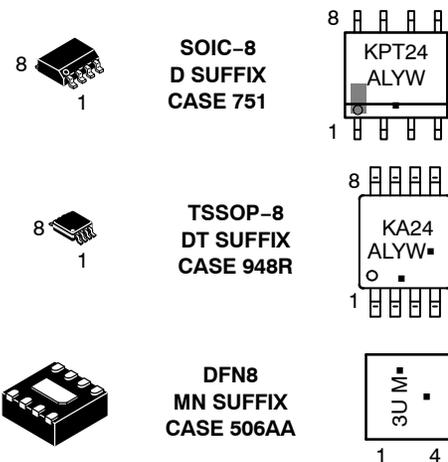
- 350 ps Typical Propagation Delay
- Maximum Input Clock Frequency > 1.0 GHz Typical
- The 100 Series Contains Temperature Compensation
- Operating Range:  $V_{CC} = 3.0\text{ V}$  to  $3.6\text{ V}$ ;  
 $V_{EE} = -3.6\text{ V}$  to  $-3.0\text{ V}$ ;  $GND = 0\text{ V}$
- PNP LVTTTL Input for Minimal Loading
- Q Output will Default HIGH with Input Open
- Pb-Free Packages are Available



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### MARKING DIAGRAMS\*



A = Assembly Location  
L = Wafer Lot  
Y = Year  
W = Work Week  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\*For additional marking information, refer to Application Note AND8002/D.

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

# MC100EPT24

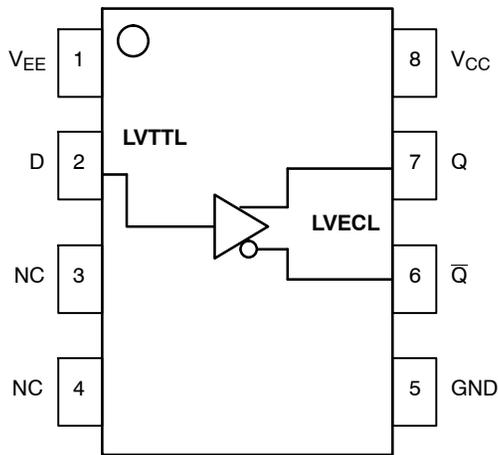


Figure 1. 8-Lead Pinout (Top View) and Logic Diagram

Table 1. PIN DESCRIPTION

PIN	FUNCTION
Q, $\bar{Q}$	Differential LVECL Outputs
D	LVTTTL Input
V <sub>CC</sub>	Positive Supply
GND	Ground
V <sub>EE</sub>	Negative Supply
NC	No Connect
EP	(DFN8 only) Thermal exposed pad must be connected to a sufficient thermal conduit. Electrically connect to the most negative supply (GND) or leave unconnected, floating open.

Table 2. ATTRIBUTES

Characteristics		Value	
Internal Input Pulldown Resistor		N/A	
Internal Input Pullup Resistor		N/A	
ESD Protection	Human Body Model Machine Model Charged Device Model	> 4 kV > 200 V > 2 kV	
Moisture Sensitivity, Indefinite Time Out of Drypack (Note 1)		Pb Pkg	Pb-Free Pkg
		Level 1	Level 1
SOIC-8		Level 1	Level 3
TSSOP-8		Level 1	Level 1
DFN8		Level 1	Level 1
Flammability Rating	Oxygen Index: 28 to 34	UL 94 V-0 @ 0.125 in	
Transistor Count		181 Devices	
Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test			

1. For additional information, see Application Note AND8003/D.

# MC100EPT24

**Table 3. MAXIMUM RATINGS**

Symbol	Parameter	Condition 1	Condition 2	Rating	Unit
V <sub>CC</sub>	Positive Power Supply	GND = 0 V	V <sub>EE</sub> = -3.3V	3.8	V
V <sub>EE</sub>	Negative Power Supply	GND = 0 V	V <sub>CC</sub> = 3.3V	-3.8	V
V <sub>IN</sub>	Input Voltage	GND = 0 V	V <sub>I</sub> ≤ V <sub>CC</sub>	0 to V <sub>CC</sub>	V
I <sub>out</sub>	Output Current	Continuous Surge		50 100	mA mA
T <sub>A</sub>	Operating Temperature Range			-40 to +85	°C
T <sub>stg</sub>	Storage Temperature Range			-65 to +150	°C
θ <sub>JA</sub>	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	SOIC-8 SOIC-8	190 130	°C/W °C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	Standard Board	SOIC-8	41 to 44	°C/W
θ <sub>JA</sub>	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	TSSOP-8 TSSOP-8	185 140	°C/W °C/W
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	Standard Board	TSSOP-8	41 to 44	°C/W
θ <sub>JA</sub>	Thermal Resistance (Junction-to-Ambient)	0 lfpm 500 lfpm	DFN8 DFN8	129 84	°C/W °C/W
T <sub>sol</sub>	Wave Solder	Pb Pb-Free		265 265	°C
θ <sub>JC</sub>	Thermal Resistance (Junction-to-Case)	(Note 2)	DFN8	35 to 40	°C/W

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

2. JEDEC standard multilayer board – 2S2P (2 signal, 2 power)

**Table 4. LVTTTL INPUT DC CHARACTERISTICS** V<sub>CC</sub> = 3.3 V, V<sub>EE</sub> = -3.6 V to -3.0 V, GND = 0.0 V; T<sub>A</sub> = -40°C to 85°C

Symbol	Characteristic	Condition	Min	Typ	Max	Unit
I <sub>IH</sub>	Input HIGH Current	V <sub>IN</sub> = 2.7 V			20	μA
I <sub>IHH</sub>	Input HIGH Current HIGH Voltage	V <sub>CC</sub> = V <sub>IN</sub> = 3.8 V			100	μA
I <sub>IL</sub>	Input LOW Current	V <sub>IN</sub> = 0.5 V			-0.6	mA
V <sub>IK</sub>	Input Clamp Voltage	I <sub>IN</sub> = -18 mA			-1.0	V
V <sub>IH</sub>	Input HIGH Voltage		2.0			V
V <sub>IL</sub>	Input LOW Voltage				0.8	V

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

**Table 5. NECL OUTPUT DC CHARACTERISTICS** V<sub>CC</sub> = 3.3 V, V<sub>EE</sub> = -3.3 V, GND = 0.0 V (Note 3)

Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
V <sub>OH</sub>	Output HIGH Voltage (Note 4)	-1145	-1020	-895	-1145	-1020	-895	-1145	-1030	-895	mV
V <sub>OL</sub>	Output LOW Voltage (Note 4)	-1945	-1820	-1695	-1945	-1820	-1695	-1945	-1820	-1695	mV
I <sub>CC</sub>	Positive Power Supply Current		2.0	4.0		2.0	4.0		2.0	4.0	mA
I <sub>EE</sub>	Negative Power Supply Current	20	30	38	20	30	38	20	30	38	mA

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

3. Output levels will vary 1:1 with GND. V<sub>EE</sub> can vary ± 0.3 V.

4. Outputs are terminated through a 50 Ω resistor to GND – 2 V.

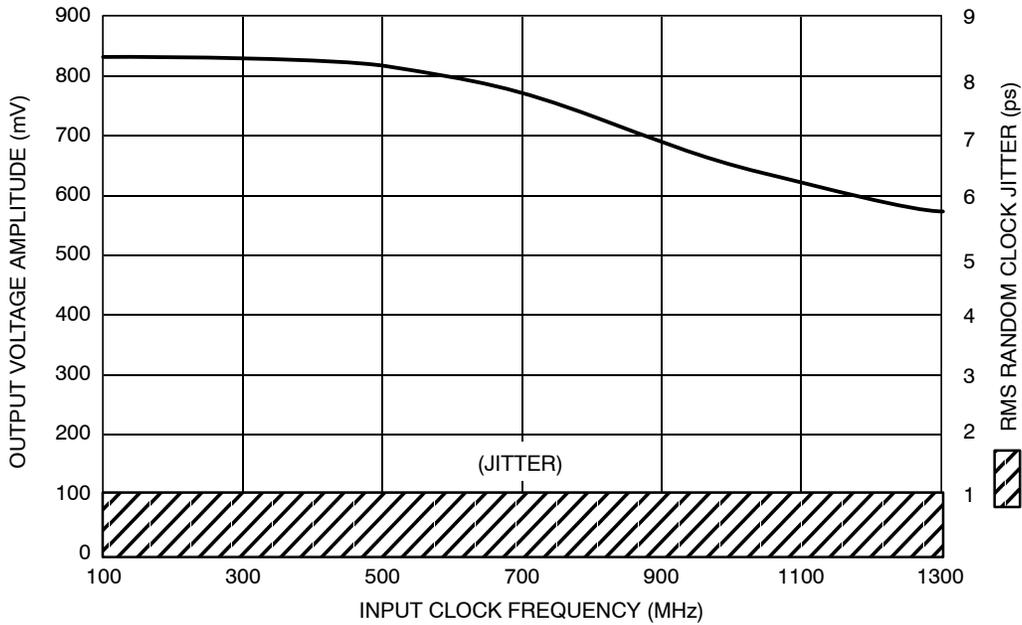
# MC100EPT24

**Table 6. AC CHARACTERISTICS**  $V_{CC} = 0\text{ V}$ ;  $V_{EE} = -3.0\text{ V to } -5.5\text{ V}$  or  $V_{CC} = 3.0\text{ V to } 5.5\text{ V}$ ;  $V_{EE} = 0\text{ V}$  (Note 5)

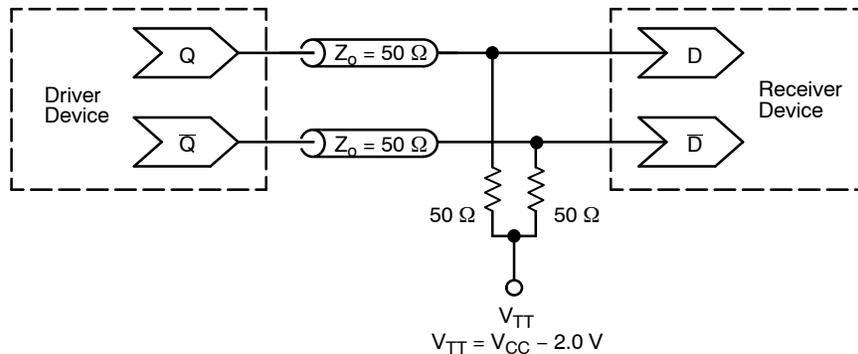
Symbol	Characteristic	-40°C			25°C			85°C			Unit
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$f_{\max}$	Maximum Input Clock Frequency (Figure 2)		> 1			> 1			> 1		GHz
$t_{PLH}$ , $t_{PHL}$	Propagation Delay to Output Differential (Note 6)	300	500	800	300	530	800	300	560	800	ps
$t_{\text{JITTER}}$	RMS Random Clock Jitter (Figure 2)		0.2	< 1		0.2	< 1		0.2	< 1	ps
$t_r$ , $t_f$	Output Rise/Fall Times (20% – 80%) @ 50 MHz Q, $\bar{Q}$	70	125	170	80	130	180	100	150	200	ps

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lpm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

- Measured using a LVTTTL source, 50% duty cycle clock source. All loading with 50  $\Omega$  to GND – 2.0 V.
- Specifications for standard TTL input signal.



**Figure 2. Output Voltage Amplitude ( $V_{OUTpp}$ )/RMS Jitter vs. Input Clock Frequency at Ambient Temperature**



**Figure 3. Typical Termination for Output Driver and Device Evaluation (See Application Note AND8020/D – Termination of ECL Logic Devices.)**

# MC100EPT24

## ORDERING INFORMATION

Device	Package	Shipping†
MC100EPT24D	SOIC-8	98 Units / Rail
MC100EPT24DG	SOIC-8 (Pb-Free)	98 Units / Rail
MC100EPT24DR2	SOIC-8	2500 / Tape & Reel
MC100EPT24DR2G	SOIC-8 (Pb-Free)	2500 / Tape & Reel
MC100EPT24DT	TSSOP-8	100 Units / Rail
MC100EPT24DTG	TSSOP-8 (Pb-Free)	100 Units / Rail
MC100EPT24DTR2	TSSOP-8	2500 / Tape & Reel
MC100EPT24DTR2G	TSSOP-8 (Pb-Free)	2500 / Tape & Reel
MC100EPT24MNR4	DFN8	1000 / Tape & Reel
MC100EPT24MNR4G	DFN8 (Pb-Free)	1000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

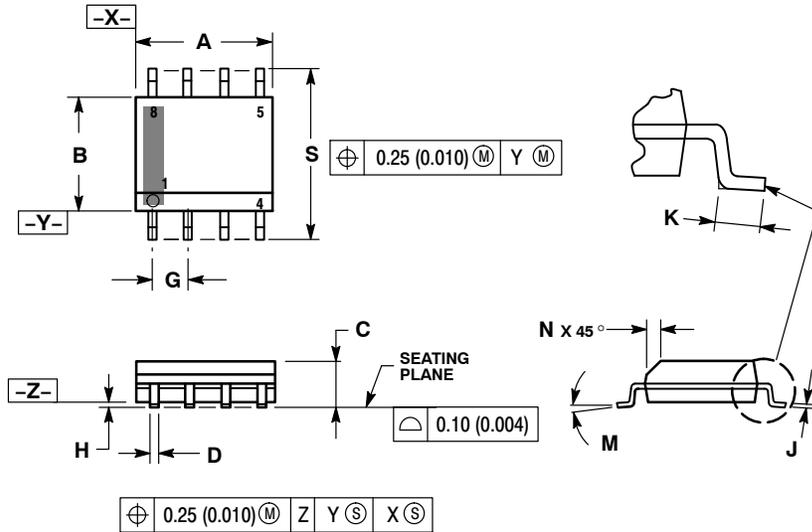
### Resource Reference of Application Notes

- AN1405/D** - ECL Clock Distribution Techniques
- AN1406/D** - Designing with PECL (ECL at +5.0 V)
- AN1503/D** - ECLinPS™ I/O SPICE Modeling Kit
- AN1504/D** - Metastability and the ECLinPS Family
- AN1568/D** - Interfacing Between LVDS and ECL
- AN1672/D** - The ECL Translator Guide
- AND8001/D** - Odd Number Counters Design
- AND8002/D** - Marking and Date Codes
- AND8020/D** - Termination of ECL Logic Devices
- AND8066/D** - Interfacing with ECLinPS
- AND8090/D** - AC Characteristics of ECL Devices

# MC100EPT24

## PACKAGE DIMENSIONS

SOIC-8 NB  
CASE 751-07  
ISSUE AH

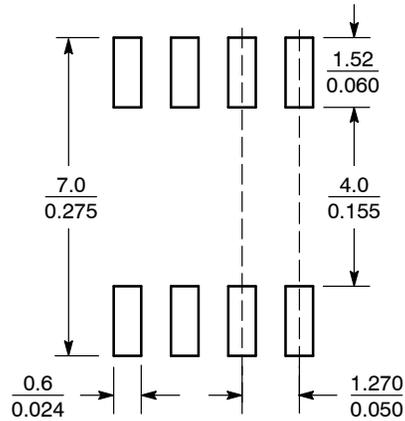


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION 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.
6. 751-01 THRU 751-06 ARE OBSOLETE. NEW STANDARD IS 751-07.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.80	5.00	0.189	0.197
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.053	0.069
D	0.33	0.51	0.013	0.020
G	1.27 BSC		0.050 BSC	
H	0.10	0.25	0.004	0.010
J	0.19	0.25	0.007	0.010
K	0.40	1.27	0.016	0.050
M	0°	8°	0°	8°
N	0.25	0.50	0.010	0.020
S	5.80	6.20	0.228	0.244

### SOLDERING FOOTPRINT\*



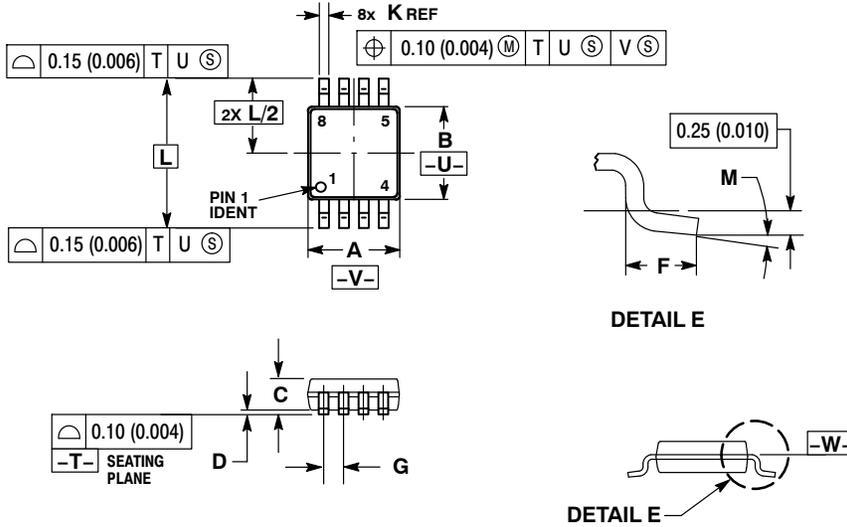
SCALE 6:1 ( $\frac{\text{mm}}{\text{inches}}$ )

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# MC100EPT24

## PACKAGE DIMENSIONS

TSSOP-8  
DT SUFFIX  
PLASTIC TSSOP PACKAGE  
CASE 948R-02  
ISSUE A



NOTES:

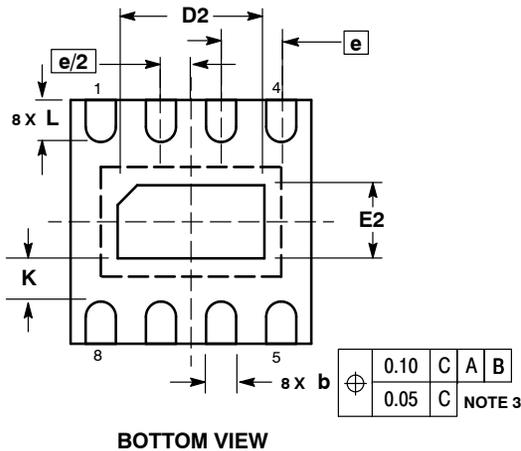
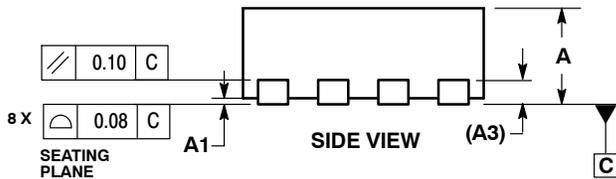
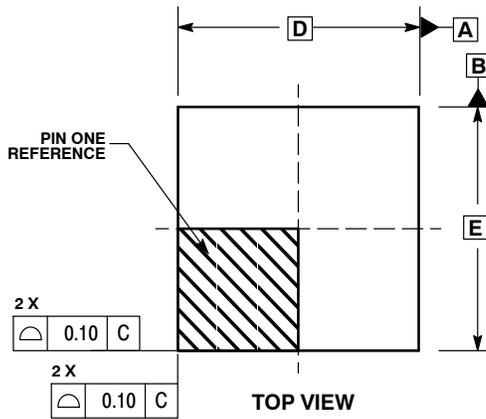
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
6. DIMENSION A AND B ARE TO BE DETERMINED AT DATUM PLANE -W-.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	2.90	3.10	0.114	0.122
B	2.90	3.10	0.114	0.122
C	0.80	1.10	0.031	0.043
D	0.05	0.15	0.002	0.006
F	0.40	0.70	0.016	0.028
G	0.65 BSC		0.026 BSC	
K	0.25	0.40	0.010	0.016
L	4.90 BSC		0.193 BSC	
M	0°	6°	0°	6°

# MC100EPT24

## PACKAGE DIMENSIONS

DFN8  
CASE 506AA-01  
ISSUE D



**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994 .
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 MM FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

DIM	MILLIMETERS	
	MIN	MAX
A	0.80	1.00
A1	0.00	0.05
A3	0.20 REF	
b	0.20	0.30
D	2.00 BSC	
D2	1.10	1.30
E	2.00 BSC	
E2	0.70	0.90
e	0.50 BSC	
K	0.20	---
L	0.25	0.35

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