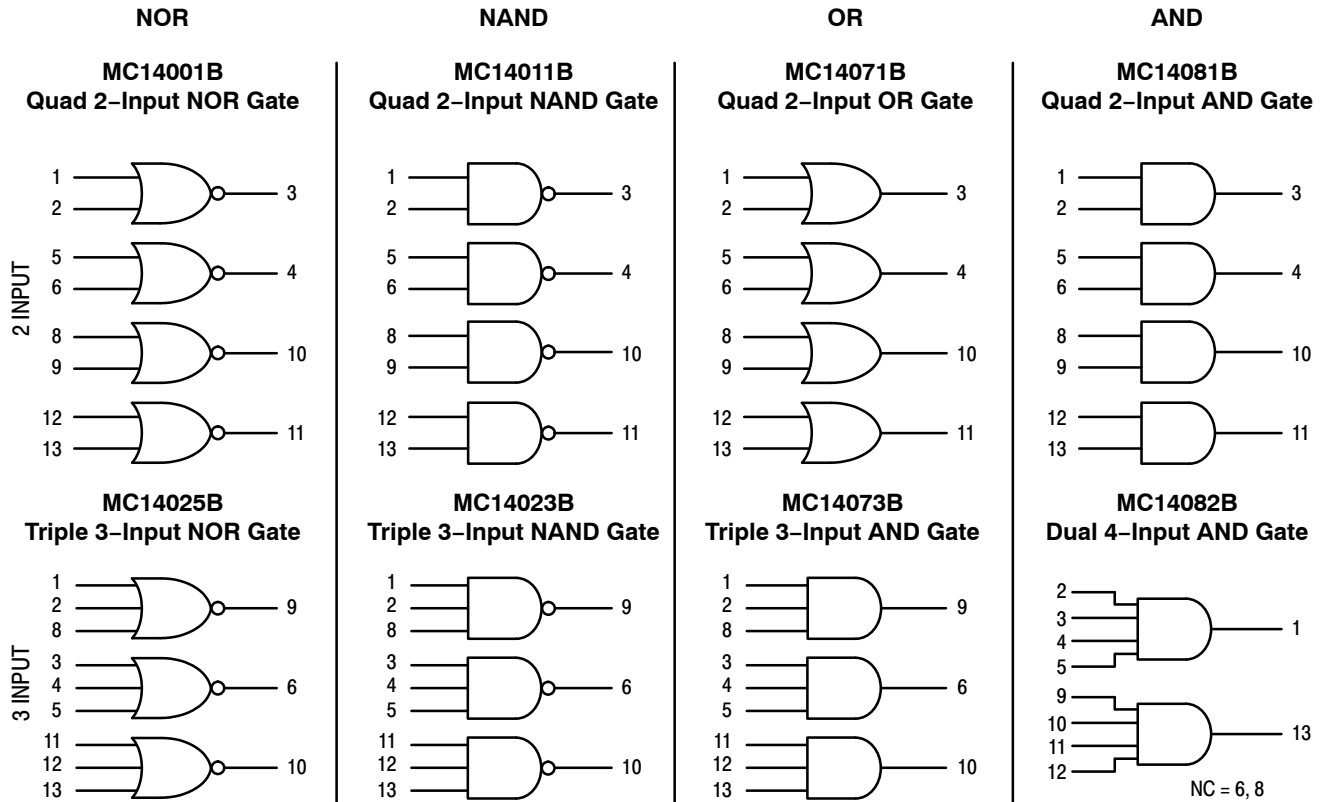


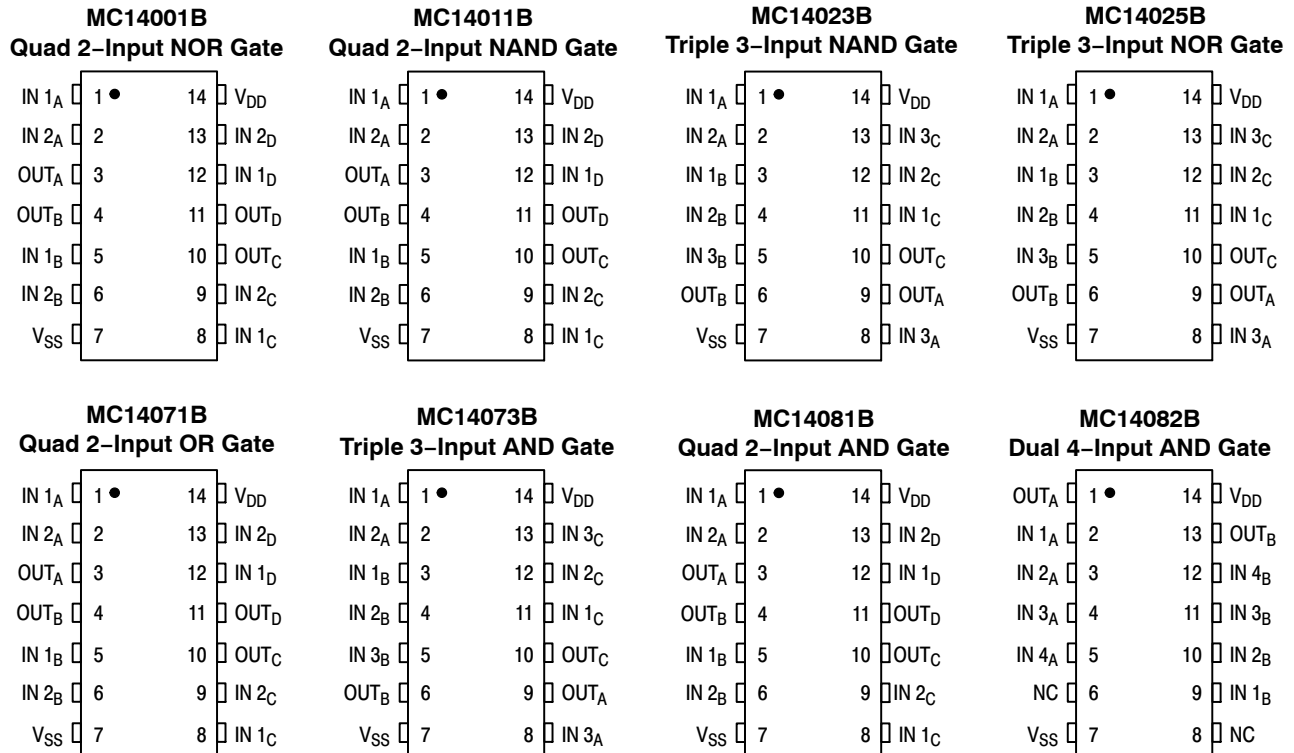
MC14001B Series

LOGIC DIAGRAMS



V_{DD} = PIN 14
 V_{SS} = PIN 7
 FOR ALL DEVICES

PIN ASSIGNMENTS



NC = NO CONNECTION

MC14001B Series

ELECTRICAL CHARACTERISTICS (Voltages Referenced to V_{SS})

Characteristic	Symbol	V _{DD} Vdc	- 55°C		25°C			125°C		Unit
			Min	Max	Min	Typ (2)	Max	Min	Max	
Output Voltage V _{in} = V _{DD} or 0 V _{in} = 0 or V _{DD}	V _{OL}	5.0	–	0.05	–	0	0.05	–	0.05	Vdc
		10	–	0.05	–	0	0.05	–	0.05	
		15	–	0.05	–	0	0.05	–	0.05	
	V _{OH}	5.0	4.95	–	4.95	5.0	–	4.95	–	Vdc
		10	9.95	–	9.95	10	–	9.95	–	
		15	14.95	–	14.95	15	–	14.95	–	
Input Voltage (V _O = 4.5 or 0.5 Vdc) (V _O = 9.0 or 1.0 Vdc) (V _O = 13.5 or 1.5 Vdc) (V _O = 0.5 or 4.5 Vdc) (V _O = 1.0 or 9.0 Vdc) (V _O = 1.5 or 13.5 Vdc)	V _{IL}	5.0	–	1.5	–	2.25	1.5	–	1.5	Vdc
		10	–	3.0	–	4.50	3.0	–	3.0	
		15	–	4.0	–	6.75	4.0	–	4.0	
	V _{IH}	5.0	3.5	–	3.5	2.75	–	3.5	–	Vdc
		10	7.0	–	7.0	5.50	–	7.0	–	
		15	11	–	11	8.25	–	11	–	
Output Drive Current (V _{OH} = 2.5 Vdc) (V _{OH} = 4.6 Vdc) (V _{OH} = 9.5 Vdc) (V _{OH} = 13.5 Vdc) (V _{OL} = 0.4 Vdc) (V _{OL} = 0.5 Vdc) (V _{OL} = 1.5 Vdc)	Source I _{OH}	5.0	– 3.0	–	– 2.4	– 4.2	–	– 1.7	–	mAdc
		5.0	– 0.64	–	– 0.51	– 0.88	–	– 0.36	–	
		10	– 1.6	–	– 1.3	– 2.25	–	– 0.9	–	
		15	– 4.2	–	– 3.4	– 8.8	–	– 2.4	–	
	Sink I _{OL}	5.0	0.64	–	0.51	0.88	–	0.36	–	mAdc
		10	1.6	–	1.3	2.25	–	0.9	–	
		15	4.2	–	3.4	8.8	–	2.4	–	
Input Current	I _{in}	15	–	± 0.1	–	± 0.00001	± 0.1	–	± 1.0	μAdc
Input Capacitance (V _{in} = 0)	C _{in}	–	–	–	–	5.0	7.5	–	–	pF
Quiescent Current (Per Package)	I _{DD}	5.0	–	0.25	–	0.0005	0.25	–	7.5	μAdc
		10	–	0.5	–	0.0010	0.5	–	15	
		15	–	1.0	–	0.0015	1.0	–	30	
Total Supply Current (3) (4) (Dynamic plus Quiescent, Per Gate, C _L = 50 pF)	I _T	5.0 10 15	I _T = (0.3 μA/kHz) f + I _{DD} /N I _T = (0.6 μA/kHz) f + I _{DD} /N I _T = (0.9 μA/kHz) f + I _{DD} /N							μAdc

2. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.

3. The formulas given are for the typical characteristics only at 25°C.

4. To calculate total supply current at loads other than 50 pF:

$$I_T(C_L) = I_T(50 \text{ pF}) + (C_L - 50) Vfk$$

where: I_T is in μA (per package), C_L in pF, V = (V_{DD} – V_{SS}) in volts, f in kHz is input frequency, and k = 0.001 x the number of exercised gates per package.

MC14001B Series

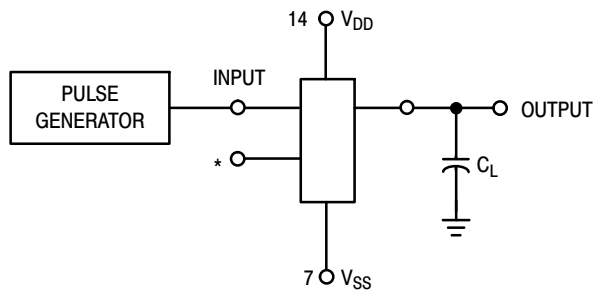
B-SERIES GATE SWITCHING TIMES

SWITCHING CHARACTERISTICS ⁽⁵⁾ ($C_L = 50 \text{ pF}$, $T_A = 25^\circ\text{C}$)

Characteristic	Symbol	V_{DD} Vdc	Min	Typ ⁽⁶⁾	Max	Unit
Output Rise Time, All B-Series Gates $t_{TLH} = (1.35 \text{ ns/pF}) C_L + 33 \text{ ns}$ $t_{TLH} = (0.60 \text{ ns/pF}) C_L + 20 \text{ ns}$ $t_{TLH} = (0.40 \text{ ns/pF}) C_L + 20 \text{ ns}$	t_{TLH}	5.0 10 15	– – –	100 50 40	200 100 80	ns
Output Fall Time, All B-Series Gates $t_{THL} = (1.35 \text{ ns/pF}) C_L + 33 \text{ ns}$ $t_{THL} = (0.60 \text{ ns/pF}) C_L + 20 \text{ ns}$ $t_{THL} = (0.40 \text{ ns/pF}) C_L + 20 \text{ ns}$	t_{THL}	5.0 10 15	– – –	100 50 40	200 100 80	ns
Propagation Delay Time MC14001B, MC14011B only $t_{PLH}, t_{PHL} = (0.90 \text{ ns/pF}) C_L + 80 \text{ ns}$ $t_{PLH}, t_{PHL} = (0.36 \text{ ns/pF}) C_L + 32 \text{ ns}$ $t_{PLH}, t_{PHL} = (0.26 \text{ ns/pF}) C_L + 27 \text{ ns}$ All Other 2, 3, and 4 Input Gates $t_{PLH}, t_{PHL} = (0.90 \text{ ns/pF}) C_L + 115 \text{ ns}$ $t_{PLH}, t_{PHL} = (0.36 \text{ ns/pF}) C_L + 47 \text{ ns}$ $t_{PLH}, t_{PHL} = (0.26 \text{ ns/pF}) C_L + 37 \text{ ns}$ 8-Input Gates (MC14068B, MC14078B) $t_{PLH}, t_{PHL} = (0.90 \text{ ns/pF}) C_L + 155 \text{ ns}$ $t_{PLH}, t_{PHL} = (0.36 \text{ ns/pF}) C_L + 62 \text{ ns}$ $t_{PLH}, t_{PHL} = (0.26 \text{ ns/pF}) C_L + 47 \text{ ns}$	t_{PLH}, t_{PHL}	5.0 10 15 5.0 10 15 5.0 10 15	– – – – – – – – –	125 50 40 160 65 50 200 80 60	250 100 80 300 130 100 350 150 110	ns

5. The formulas given are for the typical characteristics only at 25°C .

6. Data labelled "Typ" is not to be used for design purposes but is intended as an indication of the IC's potential performance.



*All unused inputs of AND, NAND gates must be connected to V_{DD} .
 All unused inputs of OR, NOR gates must be connected to V_{SS} .

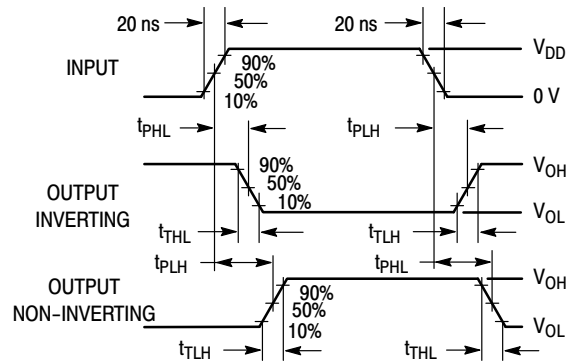
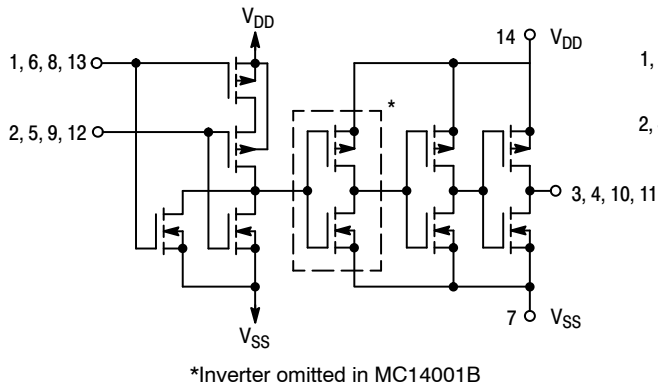


Figure 1. Switching Time Test Circuit and Waveforms

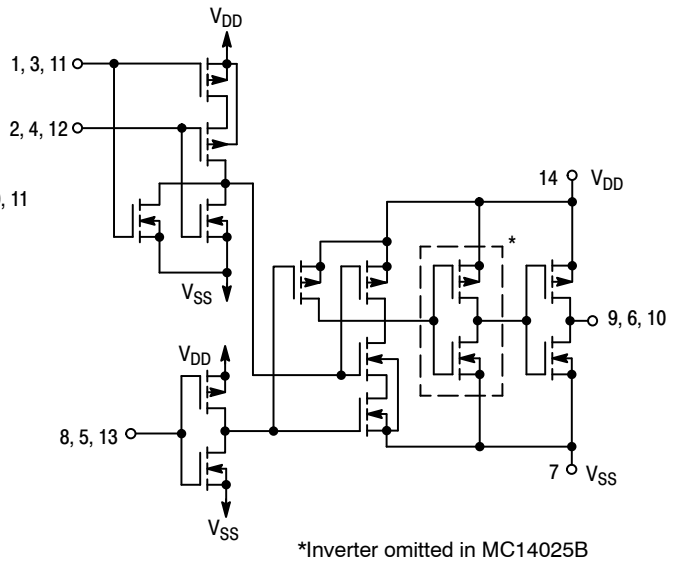
MC14001B Series

CIRCUIT SCHEMATIC NOR, OR GATES

MC14001B, MC14071B
One of Four Gates Shown

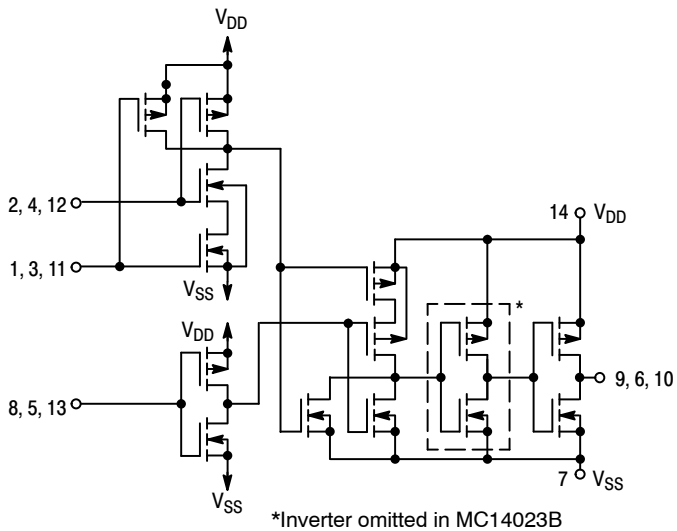


MC14025B
One of Three Gates Shown

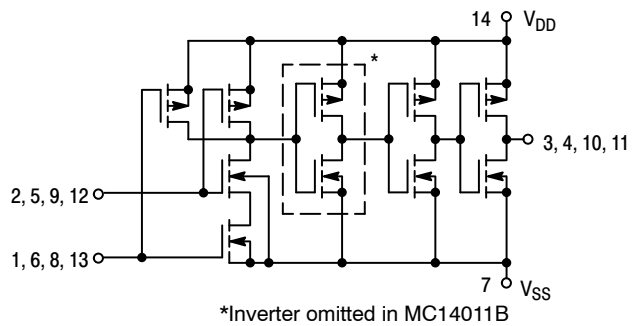


CIRCUIT SCHEMATIC NAND, AND GATES

MC14023B, MC14073B
One of Three Gates Shown



MC14011B, MC14081B
One of Four Gates Shown



TYPICAL B-SERIES GATE CHARACTERISTICS

N-CHANNEL DRAIN CURRENT (SINK)

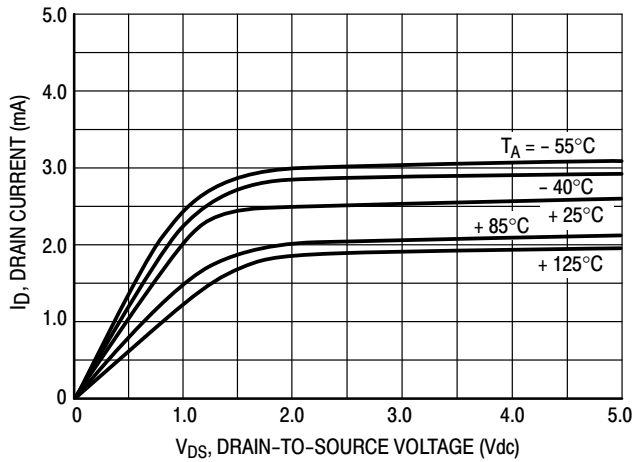


Figure 2. $V_{GS} = 5.0$ Vdc

P-CHANNEL DRAIN CURRENT (SOURCE)

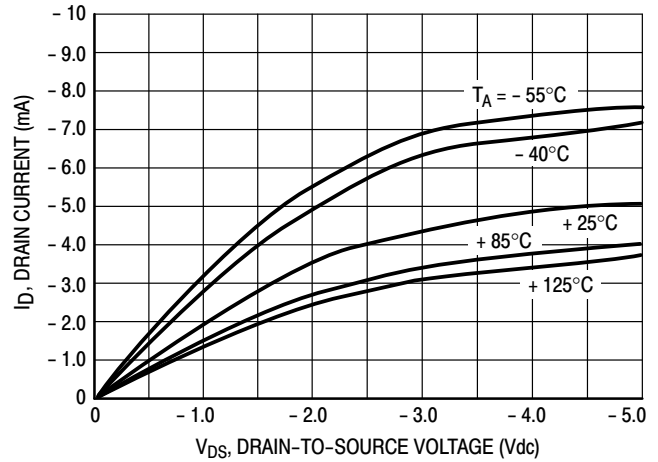


Figure 3. $V_{GS} = -5.0$ Vdc

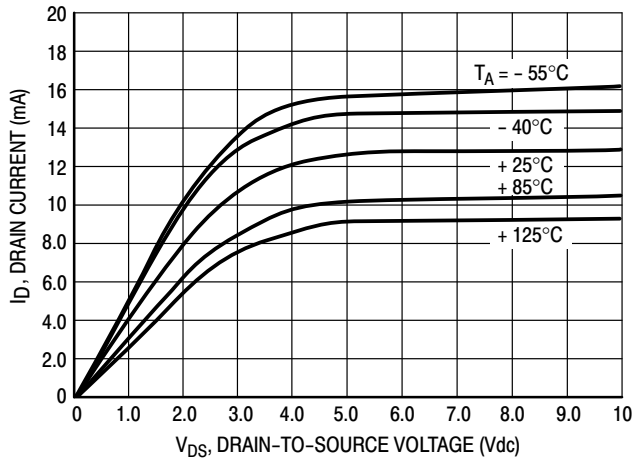


Figure 4. $V_{GS} = 10$ Vdc

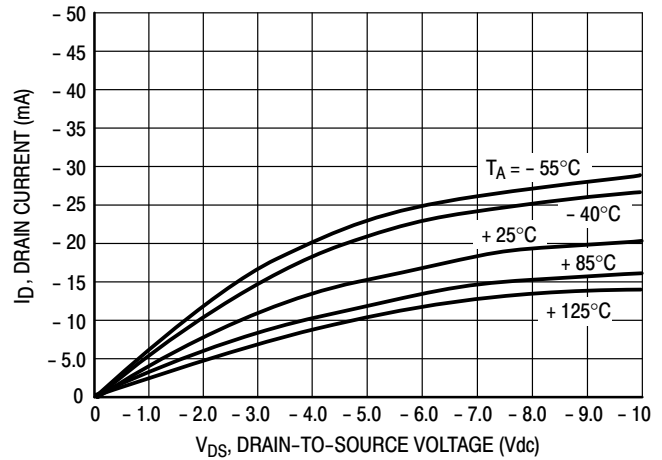


Figure 5. $V_{GS} = -10$ Vdc

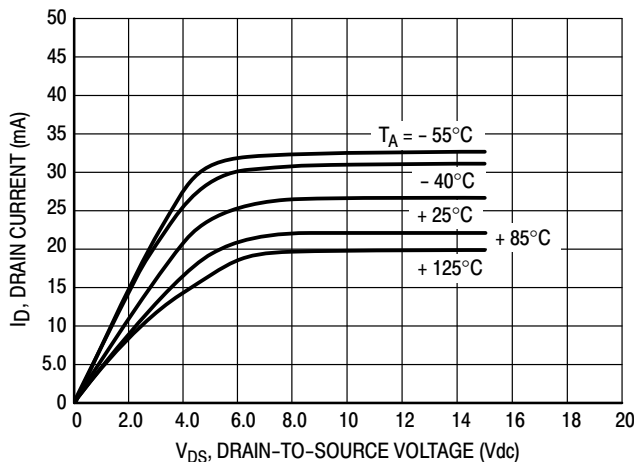


Figure 6. $V_{GS} = 15$ Vdc

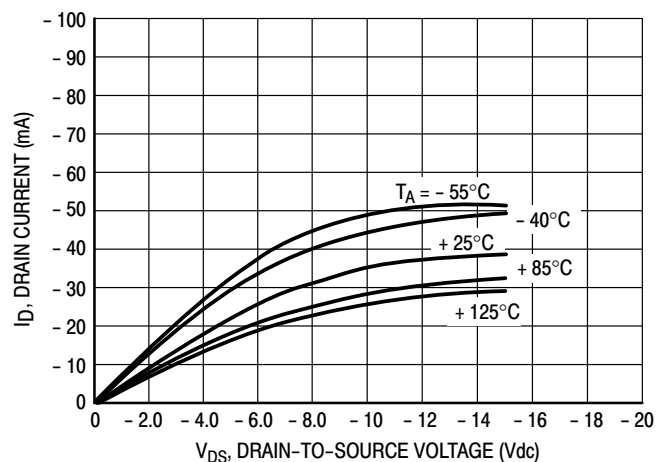


Figure 7. $V_{GS} = -15$ Vdc

These typical curves are not guarantees, but are design aids.
Caution: The maximum rating for output current is 10 mA per pin.

MC14001B Series

TYPICAL B-SERIES GATE CHARACTERISTICS (cont'd)

VOLTAGE TRANSFER CHARACTERISTICS

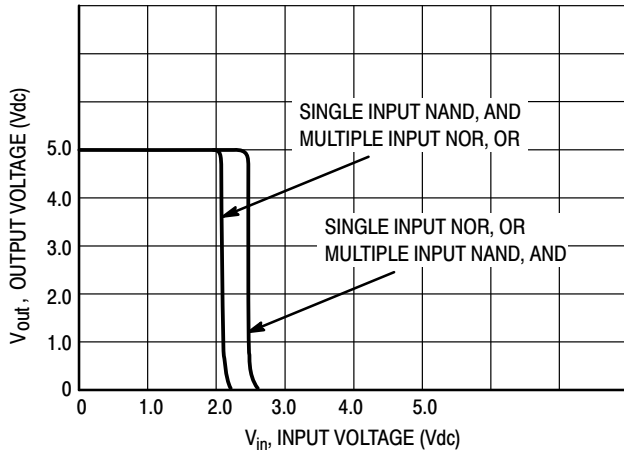


Figure 8. $V_{DD} = 5.0 \text{ Vdc}$

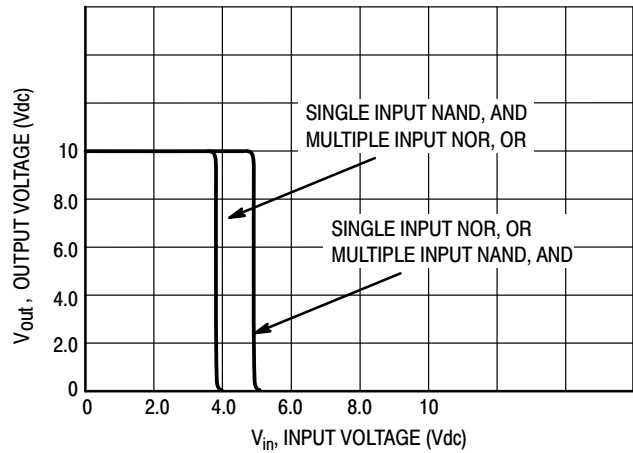


Figure 9. $V_{DD} = 10 \text{ Vdc}$

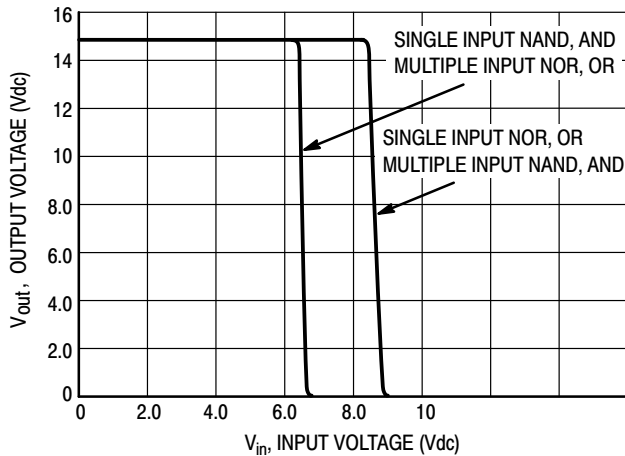


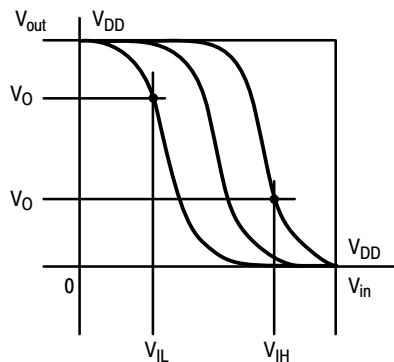
Figure 10. $V_{DD} = 15 \text{ Vdc}$

DC NOISE MARGIN

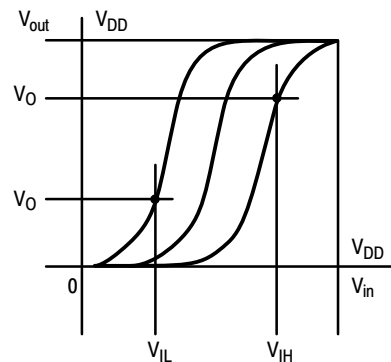
The DC noise margin is defined as the input voltage range from an ideal "1" or "0" input level which does not produce output state change(s). The typical and guaranteed limit values of the input values V_{IL} and V_{IH} for the output(s) to be at a fixed voltage V_O are given in the Electrical Characteristics table. V_{IL} and V_{IH} are presented graphically in Figure 11.

Guaranteed minimum noise margins for both the "1" and "0" levels =

- 1.0 V with a 5.0 V supply
- 2.0 V with a 10.0 V supply
- 2.5 V with a 15.0 V supply



(a) Inverting Function



(b) Non-Inverting Function

$V_{SS} = 0 \text{ VOLTS DC}$

Figure 11. DC Noise Immunity

MC14001B Series

ORDERING INFORMATION

Device	Package	Shipping†
MC14001BCP	PDIP-14	25 Units / Rail
MC14001BCPG	PDIP-14 (Pb-Free)	
MC14001BD	SOIC-14	55 Units / Rail
MC14001BDG	SOIC-14 (Pb-Free)	
MC14001BDR2	SOIC-14	2500 Units / Tape & Reel
MC14001BDR2G	SOIC-14 (Pb-Free)	
MC14001BDTR2	TSSOP-14*	
MC14001BDTR2G	TSSOP-14* (Pb-Free)	
MC14001BFEL	SOEIAJ-14	2000 Units / Tape & Reel
MC14001BFELG	SOEIAJ-14 (Pb-Free)	
MC14011BCP	PDIP-14	25 Units / Rail
MC14011BCPG	PDIP-14 (Pb-Free)	
MC14011BD	SOIC-14	55 Units / Rail
MC14011BDG	SOIC-14 (Pb-Free)	
MC14011BDR2	SOIC-14	2500 Units / Tape & Reel
MC14011BDR2G	SOIC-14 (Pb-Free)	
MC14011BDTR2	TSSOP-14*	
MC14011BDTR2G	TSSOP-14* (Pb-Free)	
MC14011BF	SOEIAJ-14	50 Units / Rail
MC14011BFG	SOEIAJ-14 (Pb-Free)	
MC14011BFEL	SOEIAJ-14	2000 Units / Tape & Reel
MC14011BFELG	SOEIAJ-14 (Pb-Free)	
MC14023BCP	PDIP-14	25 Units / Rail
MC14023BCPG	PDIP-14 (Pb-Free)	
MC14023BD	SOIC-14	55 Units / Rail
MC14023BDG	SOIC-14 (Pb-Free)	
MC14023BDR2	SOIC-14	2500 Units / Tape & Reel
MC14023BDR2G	SOIC-14 (Pb-Free)	
MC14023BFEL	SOEIAJ-14	2000 Units / Tape & Reel
MC14023BFELG	SOEIAJ-14 (Pb-Free)	

MC14001B Series

ORDERING INFORMATION

Device	Package	Shipping [†]
MC14025BCP	PDIP-14	25 Units / Rail
MC14025BCPG	PDIP-14 (Pb-Free)	
MC14025BD	SOIC-14	55 Units / Rail
MC14025BDG	SOIC-14 (Pb-Free)	
MC14025BDR2	SOIC-14	2500 Units / Tape & Reel
MC14025BDR2G	SOIC-14 (Pb-Free)	
MC14025BFEL	SOEIAJ-14	2000 Units / Tape & Reel
MC14025BFELG	SOEIAJ-14 (Pb-Free)	
MC14071BCP	PDIP-14	25 Units / Rail
MC14071BCPG	PDIP-14 (Pb-Free)	
MC14071BD	SOIC-14	55 Units / Rail
MC14071BDG	SOIC-14 (Pb-Free)	
MC14071BDR2	SOIC-14	2500 Units / Tape & Reel
MC14071BDR2G	SOIC-14 (Pb-Free)	
MC14071BDT	TSSOP-14*	96 Units per Rail
MC14071BDTG	TSSOP-14* (Pb-Free)	
MC14071BDTR2	TSSOP-14*	2500 Units / Tape & Reel
MC14071BDTR2G	TSSOP-14* (Pb-Free)	
MC14071BFEL	SOEIAJ-14	2000 Units / Tape & Reel
MC14071BFELG	SOEIAJ-14 (Pb-Free)	
MC14073BCP	PDIP-14	25 Units / Rail
MC14073BCPG	PDIP-14 (Pb-Free)	
MC14073BD	SOIC-14	55 Units / Rail
MC14073BDG	SOIC-14 (Pb-Free)	
MC14073BDR2	SOIC-14	2500 Units / Tape & Reel
MC14073BDR2G	SOIC-14 (Pb-Free)	
MC14073BFEL	SOEIAJ-14	2000 Units / Tape & Reel
MC14073BFELG	SOEIAJ-14 (Pb-Free)	

MC14001B Series

ORDERING INFORMATION

Device	Package	Shipping [†]
MC14081BCP	PDIP-14	25 Units / Rail
MC14081BCPG	PDIP-14 (Pb-Free)	
MC14081BD	SOIC-14	55 Units / Rail
MC14081BDG	SOIC-14 (Pb-Free)	
MC14081BDR2	SOIC-14	2500 Units / Tape & Reel
MC14081BDR2G	SOIC-14 (Pb-Free)	
MC14081BDTR2	TSSOP-14*	
MC14081BDTR2G	TSSOP-14* (Pb-Free)	
MC14081BFEL	SOEIAJ-14	2000 Units / Tape & Reel
MC14081BFELG	SOEIAJ-14 (Pb-Free)	
MC14082BCP	PDIP-14	2000 Units / Box
MC14082BCPG	PDIP-14 (Pb-Free)	
MC14082BD	SOIC-14	55 Units / Rail
MC14082BDG	SOIC-14 (Pb-Free)	
MC14082BDR2	SOIC-14	2500 Units / Tape & Reel
MC14082BDR2G	SOIC-14 (Pb-Free)	

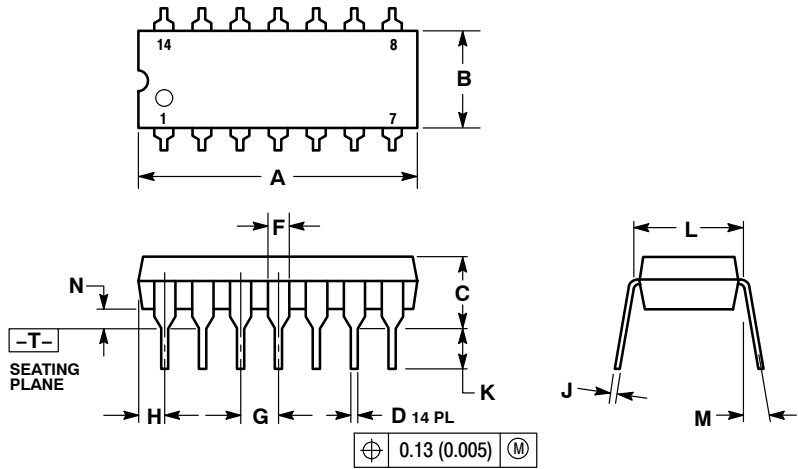
[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

*This package is inherently Pb-Free.

MC14001B Series

PACKAGE DIMENSIONS

PDIP-14
CASE 646-06
ISSUE P



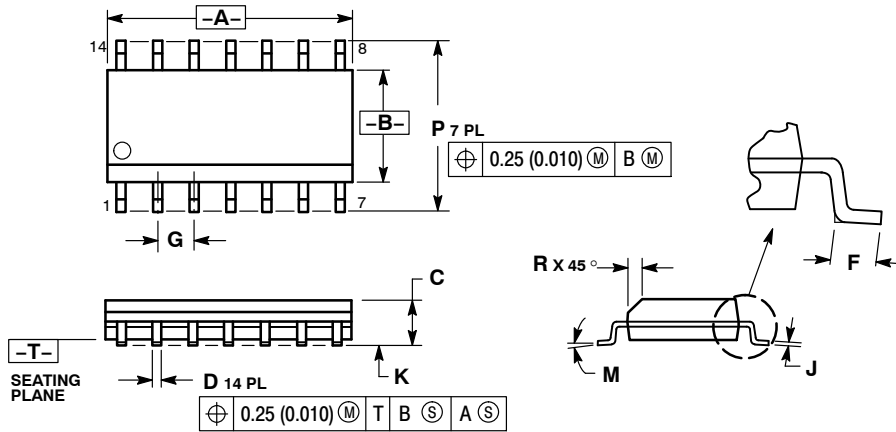
- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.
 3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
 4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
 5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.715	0.770	18.16	19.56
B	0.240	0.260	6.10	6.60
C	0.145	0.185	3.69	4.69
D	0.015	0.021	0.38	0.53
F	0.040	0.070	1.02	1.78
G	0.100 BSC		2.54 BSC	
H	0.052	0.095	1.32	2.41
J	0.008	0.015	0.20	0.38
K	0.115	0.135	2.92	3.43
L	0.290	0.310	7.37	7.87
M	10 °		10 °	
N	0.015	0.039	0.38	1.01

MC14001B Series

PACKAGE DIMENSIONS

SOIC-14
CASE 751A-03
ISSUE H

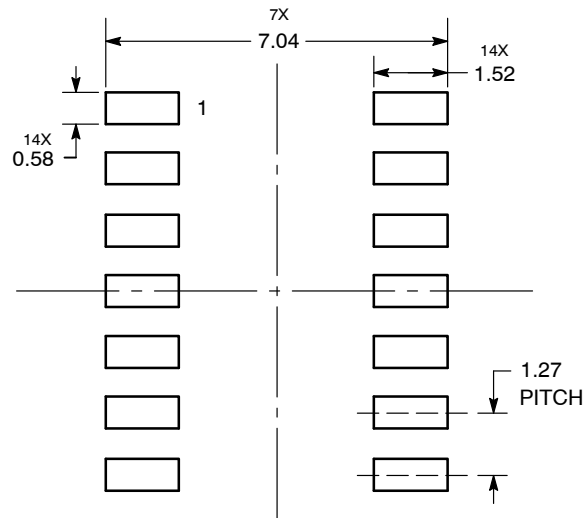


NOTES:

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.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
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	0.228	0.244
R	0.25	0.50	0.010	0.019

SOLDERING FOOTPRINT*



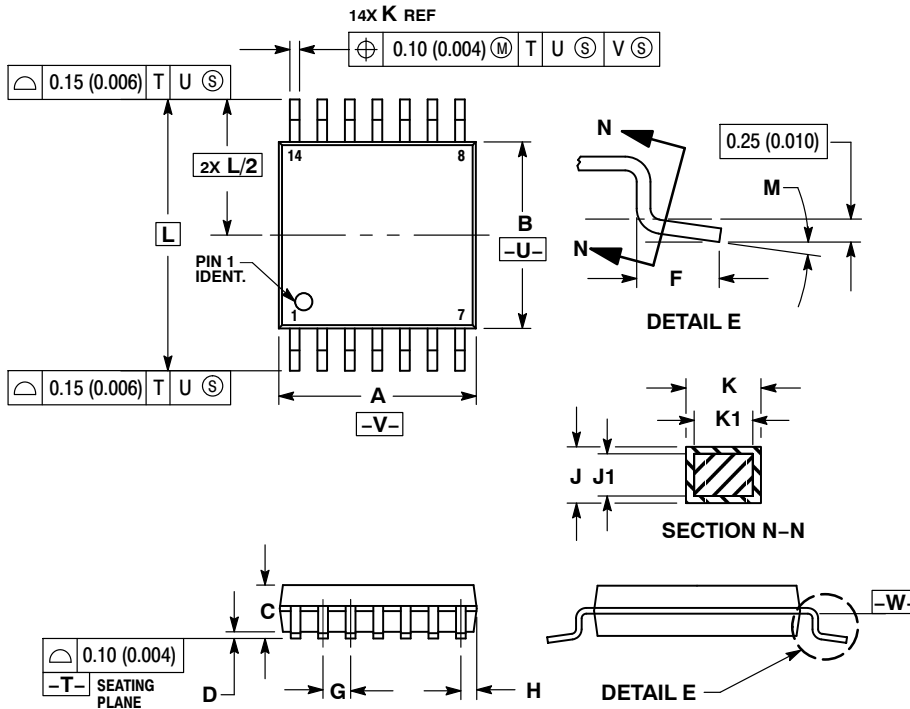
DIMENSIONS: MILLIMETERS

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

MC14001B Series

PACKAGE DIMENSIONS

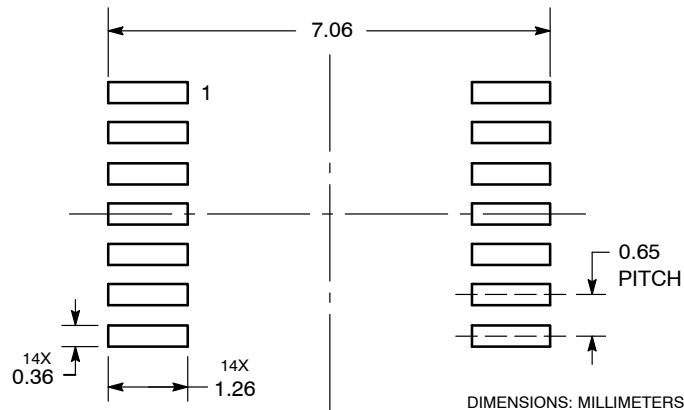
TSSOP-14
CASE 948G-01
ISSUE B



- 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-.

DIM	MILLIMETERS		INCHES	
	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	0.50	0.60	0.020	0.024
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°

SOLDERING FOOTPRINT*

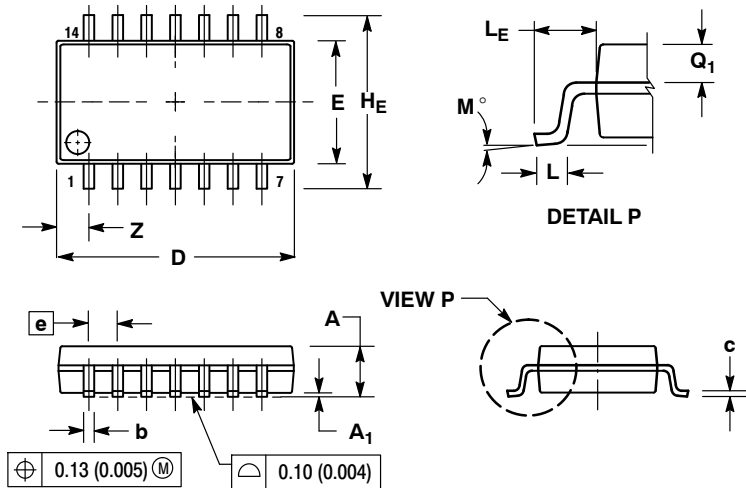


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

MC14001B Series

PACKAGE DIMENSIONS

SOEIAJ-14
CASE 965-01
ISSUE A



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).

DIM	MILLIMETERS		INCHES	
	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	0.10	0.20	0.004	0.008
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
0.50	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	---	1.42	---	0.056

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