

MC14040B

12-Bit Binary Counter

The MC14040B 12-stage binary counter is constructed with MOS P-Channel and N-Channel enhancement mode devices in a single monolithic structure. This part is designed with an input wave shaping circuit and 12 stages of ripple-carry binary counter. The device advances the count on the negative-going edge of the clock pulse. Applications include time delay circuits, counter controls, and frequency-driving circuits.

Features

- Fully Static Operation
- Diode Protection on All Inputs
- Supply Voltage Range = 3.0 Vdc to 18 Vdc
- Capable of Driving Two Low-power TTL Loads or One Low-power Schottky TTL Load Over the Rated Temperature Range
- Common Reset Line
- Pin-for-Pin Replacement for CD4040B
- These Devices are Pb-Free and are RoHS Compliant

MAXIMUM RATINGS (Voltages Referenced to V_{SS})

Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage Range	-0.5 to +18.0	V
V_{in}, V_{out}	Input or Output Voltage Range (DC or Transient)	-0.5 to $V_{DD} + 0.5$	V
I_{in}, I_{out}	Input or Output Current (DC or Transient) per Pin	± 10	mA
P_D	Power Dissipation, per Package (Note 1)	500	mW
T_A	Ambient Temperature Range	-55 to +125	$^{\circ}\text{C}$
T_{stg}	Storage Temperature Range	-65 to +150	$^{\circ}\text{C}$
T_L	Lead Temperature (8-Second Soldering)	260	$^{\circ}\text{C}$

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.

1. Temperature Derating:

Plastic "P and D/DW" Packages: - 7.0 mW/ $^{\circ}\text{C}$ From 65 $^{\circ}\text{C}$ To 125 $^{\circ}\text{C}$

This device contains protection circuitry to guard against damage due to high static voltages or electric fields. However, precautions must be taken to avoid applications of any voltage higher than maximum rated voltages to this high-impedance circuit. For proper operation, V_{in} and V_{out} should be constrained to the range $V_{SS} \leq (V_{in} \text{ or } V_{out}) \leq V_{DD}$.

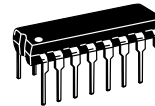
Unused inputs must always be tied to an appropriate logic voltage level (e.g., either V_{SS} or V_{DD}). Unused outputs must be left open.



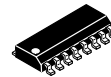
ON Semiconductor®

<http://onsemi.com>

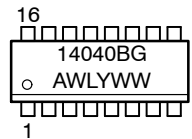
MARKING DIAGRAMS



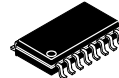
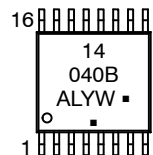
PDIP-16
P SUFFIX
CASE 648



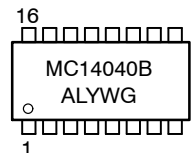
SOIC-16
D SUFFIX
CASE 751B



TSSOP-16
DT SUFFIX
CASE 948F



SOEIAJ-16
F SUFFIX
CASE 966



A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week
G or ■ = Pb-Free Package

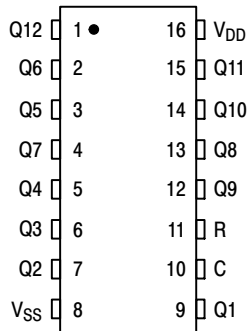
(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

MC14040B

PIN ASSIGNMENT

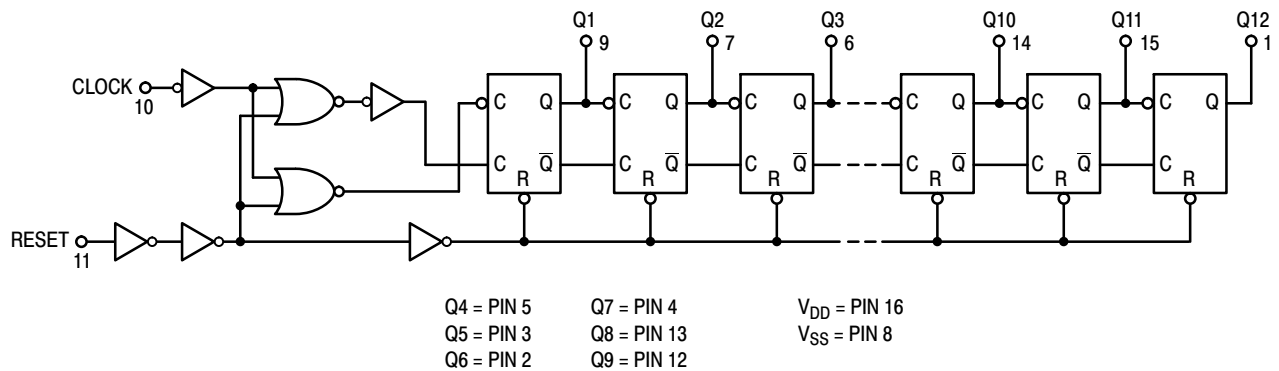


TRUTH TABLE

Clock	Reset	Output State
	0	No Change
	0	Advance to next state
X	1	All Outputs are low

X = Don't Care

LOGIC DIAGRAM



ORDERING INFORMATION

Device	Package	Shipping [†]
MC14040BCPG	PDIP-16 (Pb-Free)	500 Units / Tape & Ammunition Box
MC14040BDG	SOIC-16 (Pb-Free)	48 Units / Rail
MC14040BDR2G	SOIC-16 (Pb-Free)	2500 Units / Tape & Reel
MC14040BDTR2G	TSSOP-16*	2500 Units / Tape & Reel
MC14040BFELG	SOEIAJ-16 (Pb-Free)	2000 Units / 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.

*This package is inherently Pb-Free.

MC14040B

ELECTRICAL CHARACTERISTICS (Voltages Referenced to V_{SS})

Characteristic	Symbol	V_{DD} Vdc	- 55°C		25°C			125°C		Unit	
			Min	Max	Min	Typ (Note 2)	Max	Min	Max		
Output Voltage $V_{in} = V_{DD}$ or 0	"0" Level	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		
$V_{in} = 0$ or V_{DD}	"1" Level	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)	"0" Level	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	
($V_O = 0.5$ or 4.5 Vdc) ($V_O = 1.0$ or 9.0 Vdc) ($V_O = 1.5$ or 13.5 Vdc)	"1" Level	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)	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	-	
($V_{OL} = 0.4$ Vdc) ($V_{OL} = 0.5$ Vdc) ($V_{OL} = 1.5$ Vdc)	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	μ Adc
Input Capacitance ($V_{in} = 0$)		C_{in}	-	-	-	-	5.0	7.5	-	-	pF
Quiescent Current (Per Package)		I_{DD}	5.0	-	5.0	-	0.005	5.0	-	150	μ Adc
			10	-	10	-	0.010	10	-	300	
			15	-	20	-	0.015	20	-	600	
Total Supply Current (Notes 3 & 4) (Dynamic plus Quiescent, Per Package) ($C_L = 50$ pF on all outputs, all buffers switching)		I_T	5.0	$I_T = (0.42 \mu\text{A/kHz}) f + I_{DD}$						μ Adc	
		10	$I_T = (0.85 \mu\text{A/kHz}) f + I_{DD}$								
		15	$I_T = (1.43 \mu\text{A/kHz}) f + I_{DD}$								

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 $k = 0.001$.

MC14040B

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

Characteristic	Symbol	V_{DD} Vdc	Min	Typ (Note 6)	Max	Unit
Output Rise and Fall Time T_{TLH} , $T_{THL} = (1.5 \text{ ns/pF}) C_L + 25 \text{ ns}$ T_{TLH} , $T_{THL} = (0.75 \text{ ns/pF}) C_L + 12.5 \text{ ns}$ T_{TLH} , $T_{THL} = (0.55 \text{ ns/pF}) C_L + 9.5 \text{ ns}$	t_{TLH} , t_{THL}	5.0 10 15	- - -	100 50 40	200 100 80	ns
Propagation Delay Time Clock to Q1 t_{PHL} , $t_{PLH} = (1.7 \text{ ns/pF}) C_L + 315 \text{ ns}$ t_{PHL} , $t_{PLH} = (0.66 \text{ ns/pF}) C_L + 137 \text{ ns}$ t_{PHL} , $t_{PLH} = (0.5 \text{ ns/pF}) C_L + 95 \text{ ns}$	t_{PLH} , t_{PHL}	5.0 10 15	- - -	260 115 80	520 230 160	ns
Clock to Q12 t_{PHL} , $t_{PLH} = (1.7 \text{ ns/pF}) C_L + 2415 \text{ ns}$ t_{PHL} , $t_{PLH} = (0.66 \text{ ns/pF}) C_L + 867 \text{ ns}$ t_{PHL} , $t_{PLH} = (0.5 \text{ ns/pF}) C_L + 475 \text{ ns}$		5.0 10 15	- - -	1625 720 500	3250 1440 1000	ns
Propagation Delay Time Reset to Q_n $t_{PHL} = (1.7 \text{ ns/pF}) C_L + 485 \text{ ns}$ $t_{PHL} = (0.86 \text{ ns/pF}) C_L + 182 \text{ ns}$ $t_{PHL} = (0.5 \text{ ns/pF}) C_L + 145 \text{ ns}$	t_{PHL}	5.0 10 15	- - -	370 155 115	740 310 230	ns
Clock Pulse Width	t_{WH}	5.0 10 15	385 150 115	140 55 38	- - -	ns
Clock Pulse Frequency	f_{cl}	5.0 10 15	- - -	2.1 7.0 10.0	1.5 3.5 4.5	MHz
Clock Rise and Fall Time	t_{TLH} , t_{THL}	5.0 10 15	No Limit			ns
Reset Pulse Width	t_{WH}	5.0 10 15	960 360 270	320 120 80	- - -	ns
Reset Removal Time	t_{rem}	5.0 10 15	130 50 30	65 25 15	- - -	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.

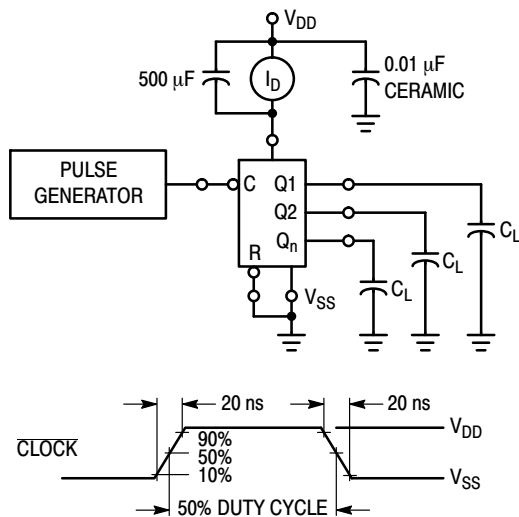


Figure 1. Power Dissipation Test Circuit and Waveform

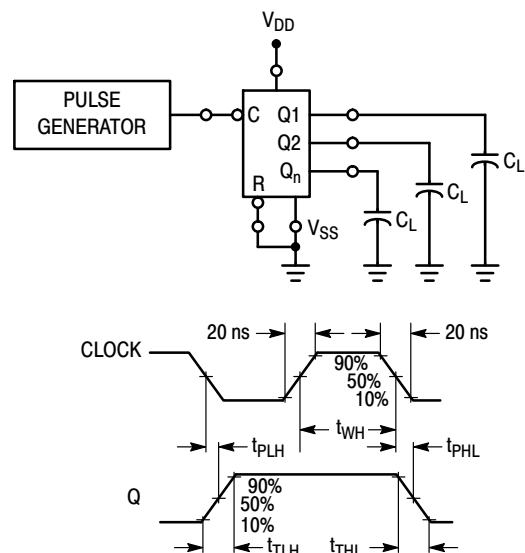


Figure 2. Switching Time Test Circuit and Waveforms

MC14040B

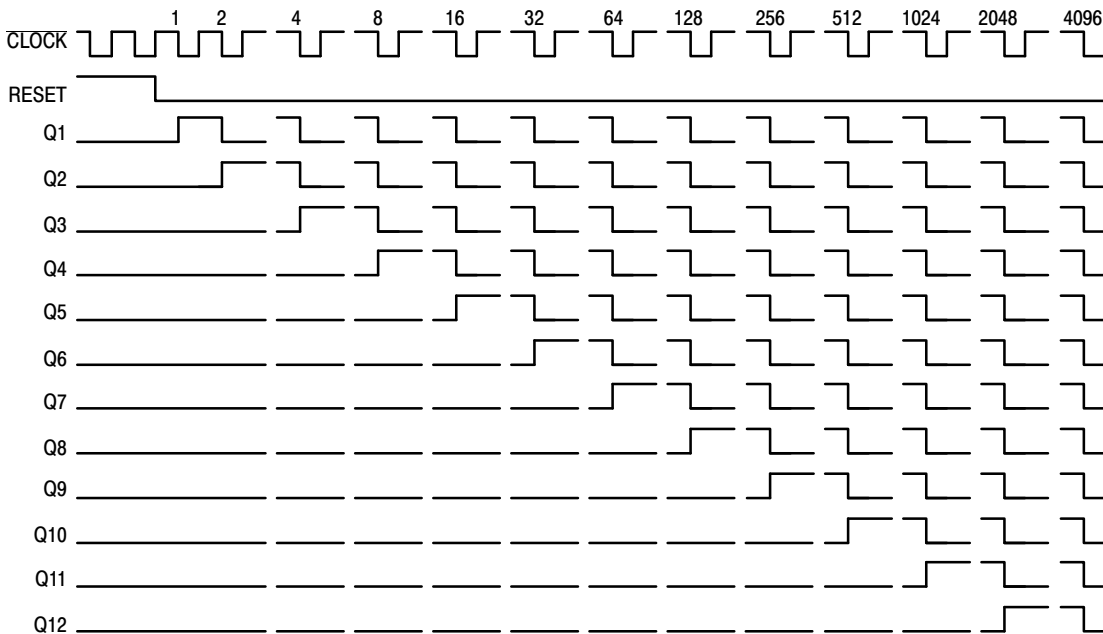


Figure 3. Timing Diagram

APPLICATIONS INFORMATION

TIME-BASE GENERATOR

A 60 Hz sinewave obtained through a 1.0 Megohm resistor connected directly to a standard 120 Vac power line is applied to the clock input of the MC14040B. By selecting

outputs Q5, Q10, Q11, and Q12 division by 3600 is accomplished. The MC14012B decodes the counter outputs, produces a single output pulse, and resets the binary counter. The resulting output frequency is 1.0 pulse/minute.

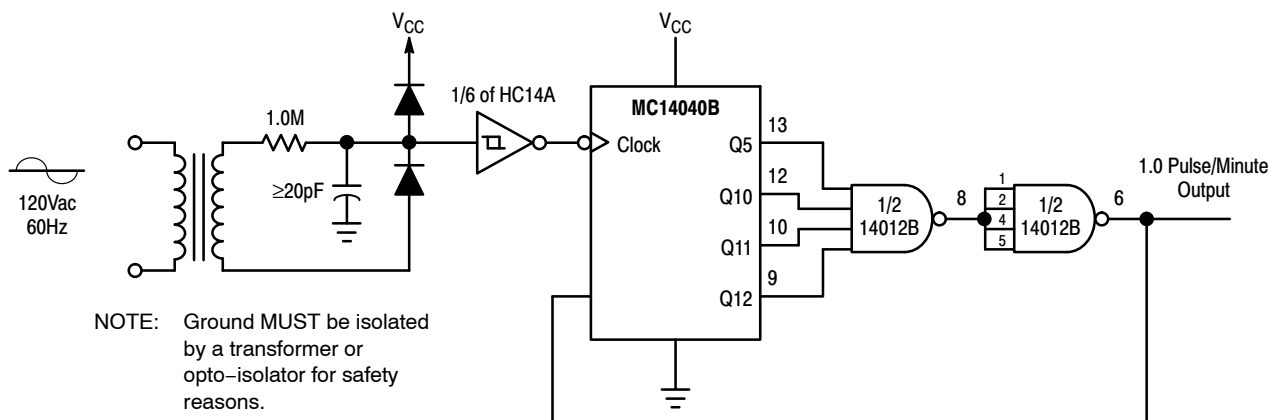
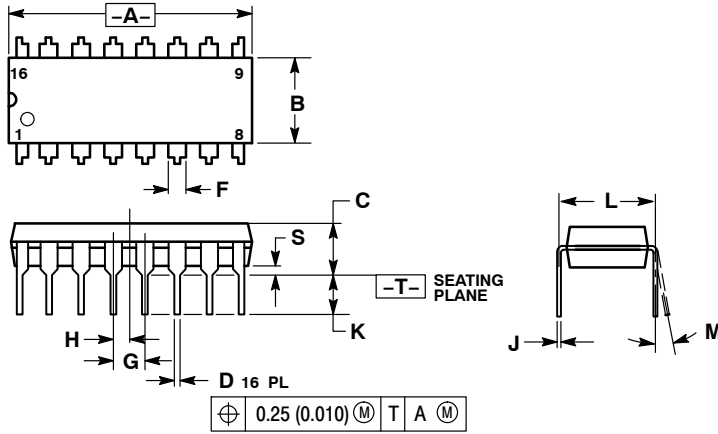


Figure 4. Time-Base Generator

MC14040B

PACKAGE DIMENSIONS

PDIP-16
P SUFFIX
PLASTIC DIP PACKAGE
CASE 648-08
ISSUE T



NOTES:

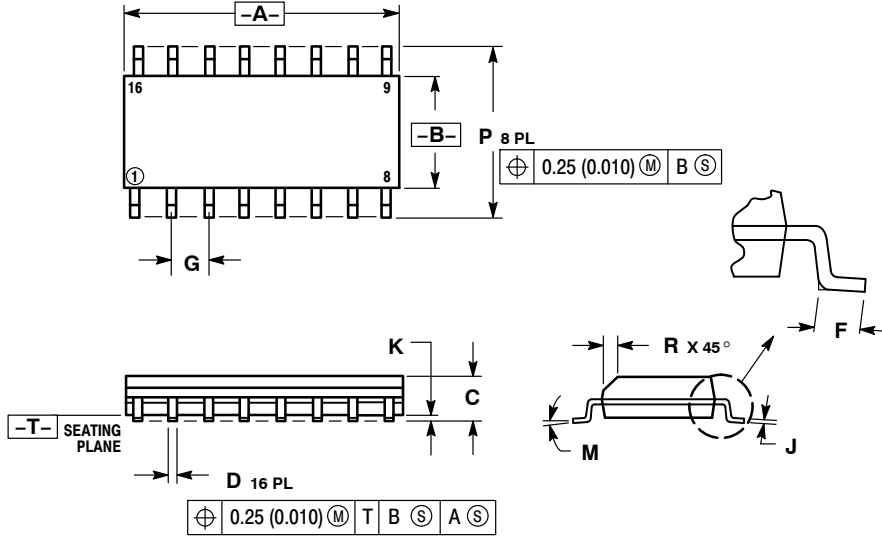
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION L TO CENTER OF LEADS WHEN FORMED PARALLEL.
4. DIMENSION B DOES NOT INCLUDE MOLD FLASH.
5. ROUNDED CORNERS OPTIONAL.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.740	0.770	18.80	19.55
B	0.250	0.270	6.35	6.85
C	0.145	0.175	3.69	4.44
D	0.015	0.021	0.39	0.53
F	0.040	0.70	1.02	1.77
G	0.100 BSC		2.54 BSC	
H	0.050 BSC		1.27 BSC	
J	0.008	0.015	0.21	0.38
K	0.110	0.130	2.80	3.30
L	0.295	0.305	7.50	7.74
M	0°	10°	0°	10°
S	0.020	0.040	0.51	1.01

MC14040B

PACKAGE DIMENSIONS

SOIC-16
D SUFFIX
PLASTIC SOIC PACKAGE
CASE 751B-05
ISSUE K

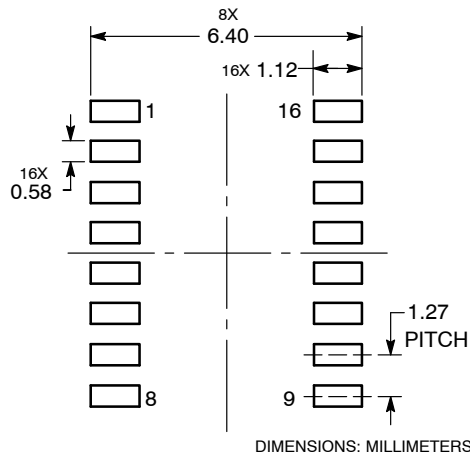


NOTES:

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	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

SOLDERING FOOTPRINT*

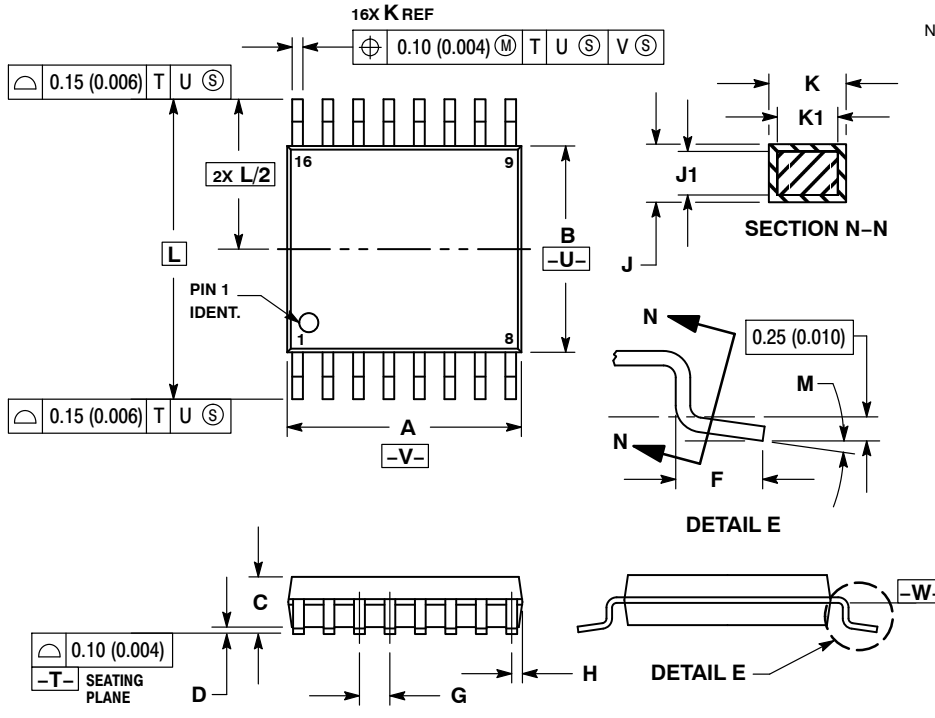


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

MC14040B

PACKAGE DIMENSIONS

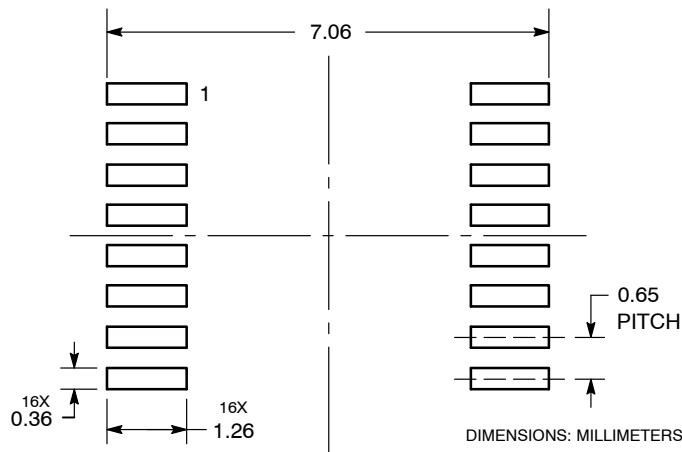
TSSOP-16
DT SUFFIX
PLASTIC TSSOP PACKAGE
CASE 948F-01
ISSUE B



- 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	0.18	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°

SOLDERING FOOTPRINT*

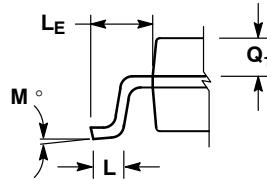
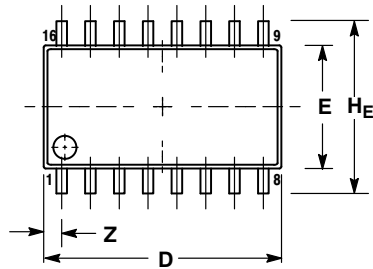


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

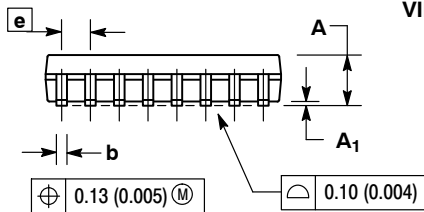
MC14040B

PACKAGE DIMENSIONS

SOEIAJ-16
F SUFFIX
PLASTIC EIAJ SOIC PACKAGE
CASE 966-01
ISSUE A



DETAIL P



VIEW P

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	0.007	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

ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5773-3850

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>
For additional information, please contact your local Sales Representative

Данный компонент на территории Российской Федерации

Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru

moschip.ru_4

moschip.ru_6

moschip.ru_9