



Is Now Part of



**ON Semiconductor®**

To learn more about ON Semiconductor, please visit our website at  
[www.onsemi.com](http://www.onsemi.com)

Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (\_), the underscore (\_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (\_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at [www.onsemi.com](http://www.onsemi.com). Please email any questions regarding the system integration to [Fairchild\\_questions@onsemi.com](mailto:Fairchild_questions@onsemi.com).

ON Semiconductor and the ON Semiconductor logo are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor 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 ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## MM74HC393 Dual 4-Bit Binary Counter

### General Description

The MM74HC393 counter circuits contain independent ripple carry counters and utilize advanced silicon-gate CMOS technology. The MM74HC393 contains two 4-bit ripple carry binary counters, which can be cascaded to create a single divide-by-256 counter.

Each of the two 4-bit counters is incremented on the HIGH-to-LOW transition (negative edge) of the clock input, and each has an independent clear input. When clear is set HIGH all four bits of each counter are set to a low level. This enables count truncation and allows the implementation of divide-by-N counter configurations.

Each of the counters outputs can drive 10 low power Schottky TTL equivalent loads. This counter is functionally as well as pin equivalent to the 74LS393. All inputs are protected from damage due to static discharge by diodes to  $V_{CC}$  and ground.

### Features

- Typical operating frequency: 50 MHz
- Typical propagation delay: 13 ns (Ck to  $Q_A$ )
- Wide operating supply voltage range: 2–6V
- Low input current:  $<1 \mu A$
- Low quiescent supply current: 80  $\mu A$  maximum (74HC Series)
- Fanout of 10 LS-TTL loads

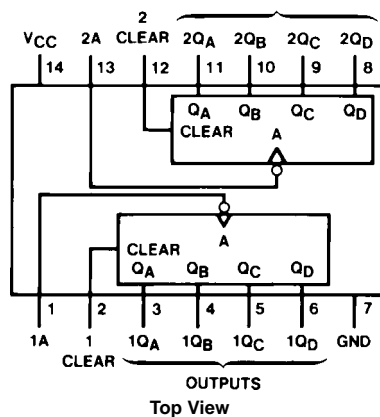
### Ordering Code:

Order Number	Package Number	Package Description
MM74HC393M	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
MM74HC393SJ	M14D	Pb-Free 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
MM74HC393MTC	MTC14	14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
MM74HC393N	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.  
Pb-Free package per JEDEC J-STD-020B.

### Connection Diagram

Pin Assignments for DIP, SOIC, SOP and TSSOP  
OUTPUTS



**Absolute Maximum Ratings**

(Note 2)

(Note 1)

Supply Voltage ( $V_{CC}$ )	-0.5 to +7.0V
DC Input Voltage ( $V_{IN}$ )	-1.5 to $V_{CC}+1.5V$
DC Output Voltage ( $V_{OUT}$ )	-0.5 to $V_{CC}+0.5V$
Clamp Diode Current ( $I_{IK}, I_{OK}$ )	$\pm 20$ mA
DC Output Current, per pin ( $I_{OUT}$ )	$\pm 25$ mA
DC $V_{CC}$ or GND Current, per pin ( $I_{CC}$ )	$\pm 50$ mA
Storage Temperature Range ( $T_{STG}$ )	-65°C to +150°C
Power Dissipation ( $P_D$ )	
(Note 3)	600 mW
S.O. Package only	500 mW
Lead Temperature ( $T_L$ )	
(Soldering 10 seconds)	260°C

**Recommended Operating Conditions**

	Min	Max	Units
Supply Voltage ( $V_{CC}$ )	2	6	V
DC Input or Output Voltage ( $V_{IN}, V_{OUT}$ )	0	$V_{CC}$	V
Operating Temperature Range ( $T_A$ )	-40	+85	°C
Input Rise or Fall Times ( $t_r, t_f$ ) $V_{CC} = 2.0V$		1000	ns
$V_{CC} = 4.5V$		500	ns
$V_{CC} = 6.0V$		400	ns

**Note 1:** Absolute Maximum Ratings are those values beyond which damage to the device may occur.

**Note 2:** Unless otherwise specified all voltages are referenced to ground.

**Note 3:** Power Dissipation temperature derating — plastic "N" package: -12 mW/°C from 65°C to 85°C.

**DC Electrical Characteristics** (Note 4)

Symbol	Parameter	Conditions	$V_{CC}$	$T_A = 25^\circ\text{C}$			Units	
				Typ	Guaranteed Limits			
$V_{IH}$	Minimum HIGH Level Input Voltage		2.0V		1.5	1.5	1.5	V
			4.5V		3.15	3.15	3.15	V
			6.0V		4.2	4.2	4.2	V
$V_{IL}$	Maximum LOW Level Input Voltage		2.0V		0.5	0.5	0.5	V
			4.5V		1.35	1.35	1.35	V
			6.0V		1.8	1.8	1.8	V
$V_{OH}$	Minimum HIGH Level Output Voltage	$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 20 \mu\text{A}$	2.0V	2.0	1.9	1.9	1.9	V
			4.5V	4.5	4.4	4.4	4.4	V
			6.0V	6.0	5.9	5.9	5.9	V
		$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 4.0 \text{ mA}$ $ I_{OUT}  \leq 5.2 \text{ mA}$	4.5V	4.2	3.98	3.84	3.7	V
			6.0V	5.7	5.48	5.34	5.2	V
$V_{OL}$	Maximum LOW Level Output Voltage	$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 20 \mu\text{A}$	2.0V	0	0.1	0.1	0.1	V
			4.5V	0	0.1	0.1	0.1	V
			6.0V	0	0.1	0.1	0.1	V
		$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 4.0 \text{ mA}$ $ I_{OUT}  \leq 5.2 \text{ mA}$	4.5V	0.2	0.26	0.33	0.4	V
			6.0V	0.2	0.26	0.33	0.4	V
$I_{IN}$	Maximum Input Current	$V_{IN} = V_{CC}$ or GND	6.0V		$\pm 0.1$	$\pm 1.0$	$\pm 1.0$	$\mu\text{A}$
$I_{CC}$	Maximum Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND $I_{OUT} = 0 \mu\text{A}$	6.0V		8.0	80	160	$\mu\text{A}$

**Note 4:** For a power supply of  $5V \pm 10\%$  the worst case output voltages ( $V_{OH}$  and  $V_{OL}$ ) occur for HC at 4.5V. Thus the 4.5V values should be used when designing with this supply. Worst case  $V_{IH}$  and  $V_{IL}$  occur at  $V_{CC} = 5.5V$  and 4.5V respectively. (The  $V_{IH}$  value at 5.5V is 3.85V.) The worst case leakage current ( $I_{IN}$ ,  $I_{CC}$ , and  $I_{OZ}$ ) occur for CMOS at the higher voltage and so the 6.0V values should be used.

**AC Electrical Characteristics** $V_{CC} = 5V$ ,  $T_A = 25^\circ C$ ,  $C_L = 15 \text{ pF}$ ,  $t_r = t_f = 6 \text{ ns}$ 

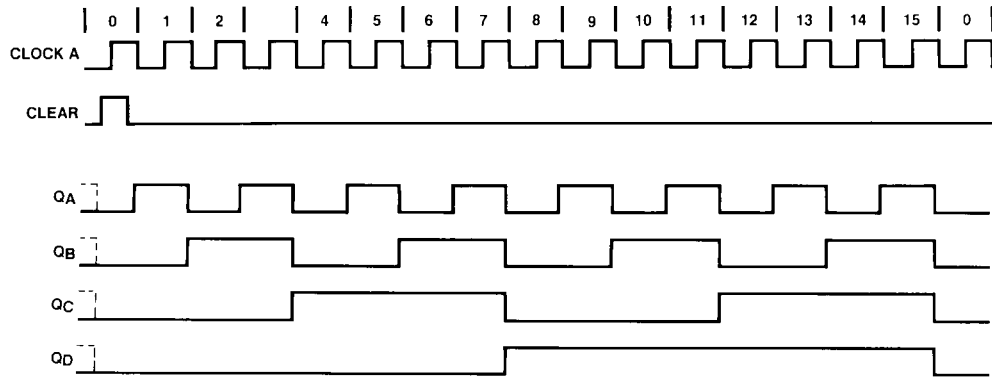
Symbol	Parameter	Conditions	Typ	Guaranteed Limit	Units
$f_{MAX}$	Maximum Operating Frequency		50	30	MHz
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay, Clock A to $Q_A$		13	20	ns
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay, Clock A to $Q_B$		19	35	ns
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay, Clock A to $Q_C$		23	42	ns
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay, Clock A to $Q_D$		27	50	ns
$t_{PHL}$	Maximum Propagation Delay, Clear to any Q		15	28	ns
$t_{REM}$	Minimum Removal Time		-2	5	ns
$t_W$	Minimum Pulse Width Clear or Clock		10	16	ns

**AC Electrical Characteristics** $C_L = 50 \text{ pF}$ ,  $t_r = t_f = 6 \text{ ns}$  (unless otherwise specified)

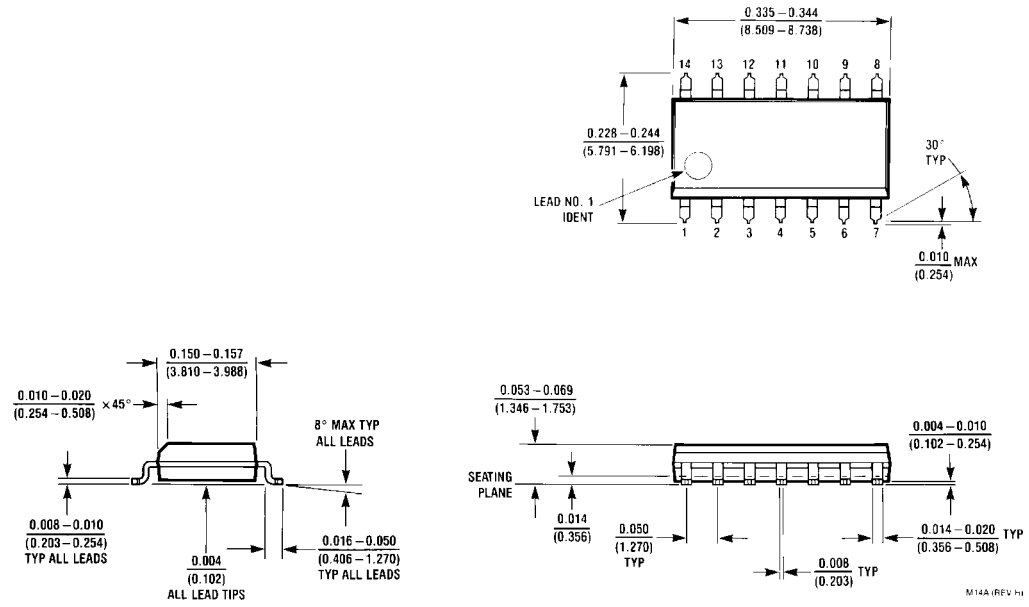
Symbol	Parameter	Conditions	$V_{CC}$	$T_A = 25^\circ C$			$T_A = -40 \text{ to } 85^\circ C$	$T_A = -55 \text{ to } 125^\circ C$	Units
				Typ	Guaranteed Limits				
$f_{MAX}$	Maximum Operating Frequency		2.0V	5	4	3			
			4.5V	27	21	18			MHz
			6.0V	31	24	20			MHz
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay Clock A to $Q_A$		2.0V	45	120	150	180		ns
			4.5V	15	24	30	35		ns
			6.0V	13	21	26	31		ns
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay Clock A to $Q_B$		2.0V	68	190	240	285		ns
			4.5V	23	38	47	57		ns
			6.0V	20	32	40	48		ns
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay Clock A to $Q_C$		2.0V	90	240	300	360		ns
			4.5V	30	48	60	72		ns
			6.0V	26	41	51	61		ns
$t_{PHL}$ , $t_{PLH}$	Maximum Propagation Delay Clock to $Q_D$		2.0V	100	290	360	430		ns
			4.5V	35	58	72	87		ns
			6.0V	30	50	62	75		ns
$t_{PHL}$	Maximum Propagation Delay Clear to any Q		2.0V	54	165	210	250		ns
			4.5V	18	33	41	49		ns
			6.0V	15	28	35	42		ns
$t_{REM}$	Minimum Clear Removal Time		2.0V	25	25	25	25		ns
			4.5V	5	5	5	5		ns
			6.0V	5	5	5	5		ns
$t_W$	Minimum Pulse Width Clear or Clock		2.0V	30	80	100	120		ns
			4.5V	10	16	20	24		ns
			6.0V	9	14	18	20		ns
$t_{THL}$ , $t_{TLH}$	Maximum Output Rise and Fall Time		2.0V	30	75	95	110		ns
			4.5V	8	15	19	22		ns
			6.0V	7	13	16	19		ns
$t_r$ , $t_f$	Maximum Input Rise and Fall Time				1000	1000	1000		ns
					500	500	500		ns
					400	400	400		ns
$C_{PD}$	Power Dissipation Capacitance (Note 5)	(per counter)		42					pF
$C_{IN}$	Maximum Input Capacitance			5	10	10	10		pF

**Note 5:**  $C_{PD}$  determines the no load dynamic power consumption,  $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$ , and the no load dynamic current consumption,  $I_S = C_{PD} V_{CC} f + I_{CC}$ .

### Logic Timing Waveforms

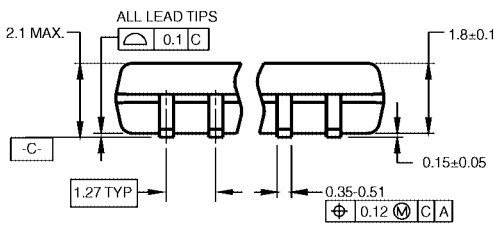
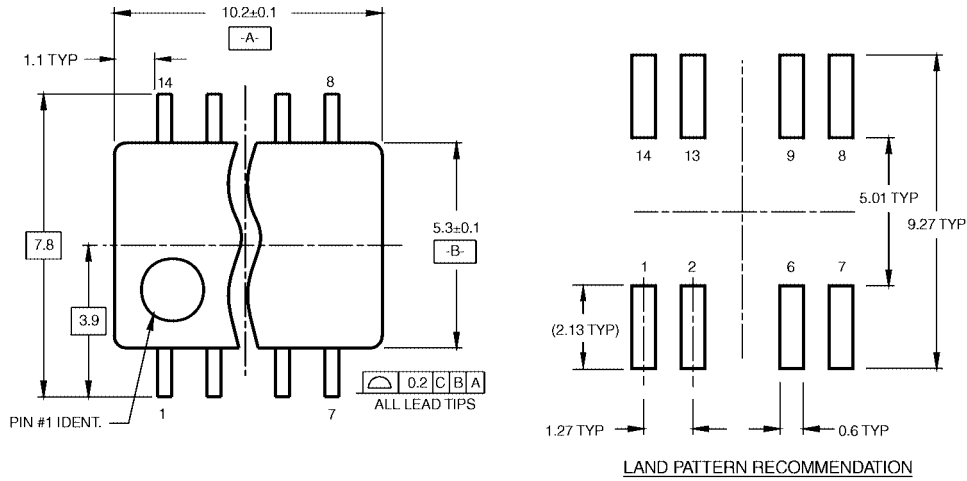


**Physical Dimensions** inches (millimeters) unless otherwise noted



**14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow  
Package Number M14A**

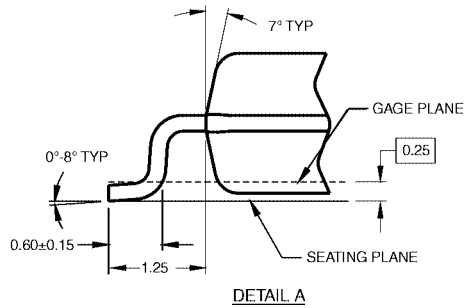
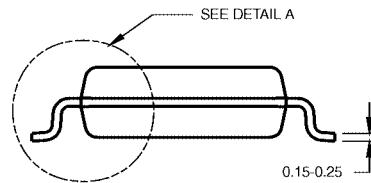
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



DIMENSIONS ARE IN MILLIMETERS

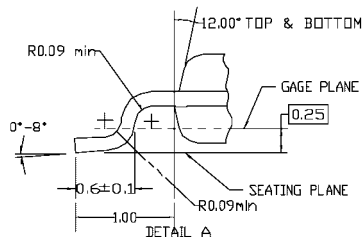
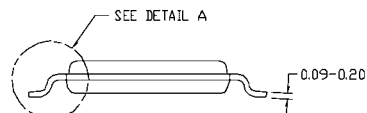
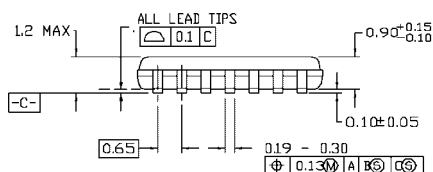
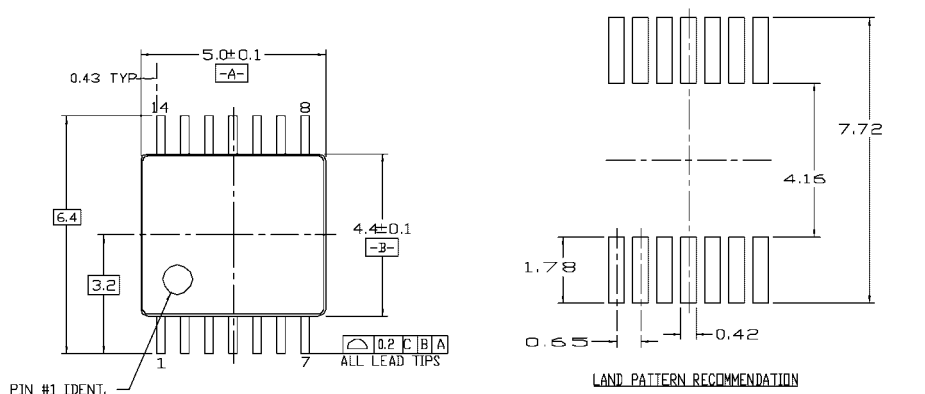
- NOTES:  
 A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.  
 B. DIMENSIONS ARE IN MILLIMETERS.  
 C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M14DRevB1



**Pb-Free 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide  
 Package Number M14D**

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



NOTES:

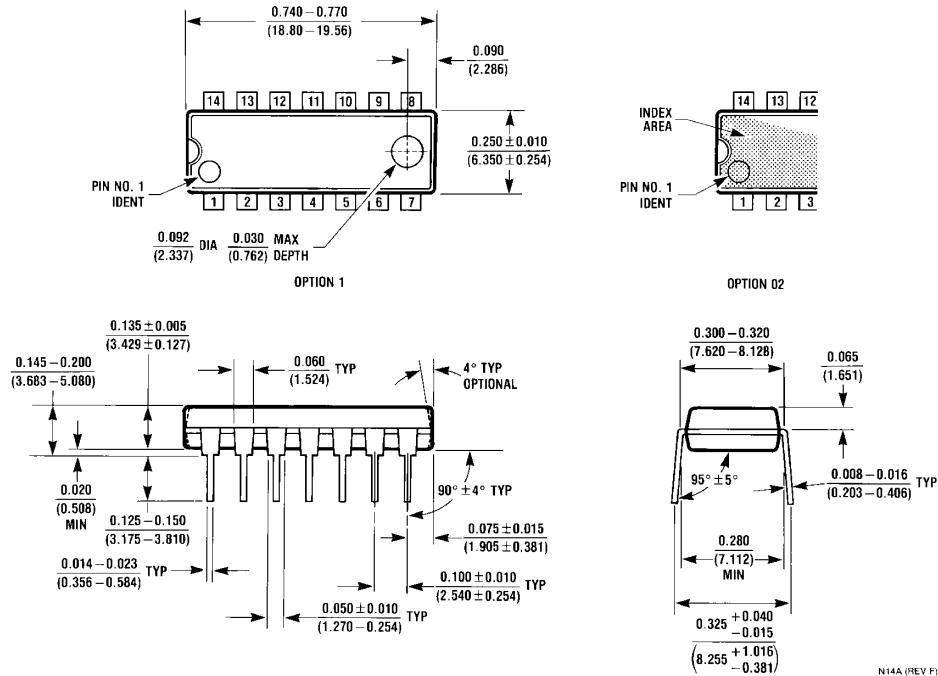
- A. CONFORMS TO JEDEC REGISTRATION MO-153 VARIATION AB, REF NOTE 6, DATED 7/93
- B. DIMENSIONS ARE IN MILLIMETERS
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS
- D. DIMENSIONING AND TOLERANCES PER ANSI Y14.5M, 1982

MTC14revD

**14-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide Package Number MTC14**



**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide Package Number N14A

Fairchild does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and Fairchild reserves the right at any time without notice to change said circuitry and specifications.

**LIFE SUPPORT POLICY**

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

[www.fairchildsemi.com](http://www.fairchildsemi.com)

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor's product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor 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 ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor 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  
19521 E. 32nd Pkwy, Aurora, Colorado 80011 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](mailto: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: 81-3-5817-1050

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