ON Semiconductor

Is Now



To learn more about onsemi™, please visit our website at
www.onsemi.com

onsemi and onsemi and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi** product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** 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 **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** 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. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** 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 **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** 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 **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner. Other names and brands may be claimed as the property of others.



Is Now Part of



ON Semiconductor®

OBSOLETE
THIS DEVICE IS OBSOLETE
PLEASE CONTACT YOUR ON SEMICONDUCTOR
REPRESENTATIVE FOR INFORMATION

To learn more about ON Semiconductor, please visit our website at
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. Please email any questions regarding the system integration to 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. 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.

LM2903,LM393/LM393A,LM293A

Dual Differential Comparator

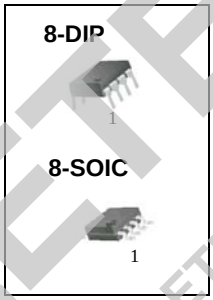
OBSOLETE
THIS DEVICE IS OBSOLETE
PLEASE CONTACT YOUR ON SEMICONDUCTOR
REPRESENTATIVE FOR INFORMATION

Features

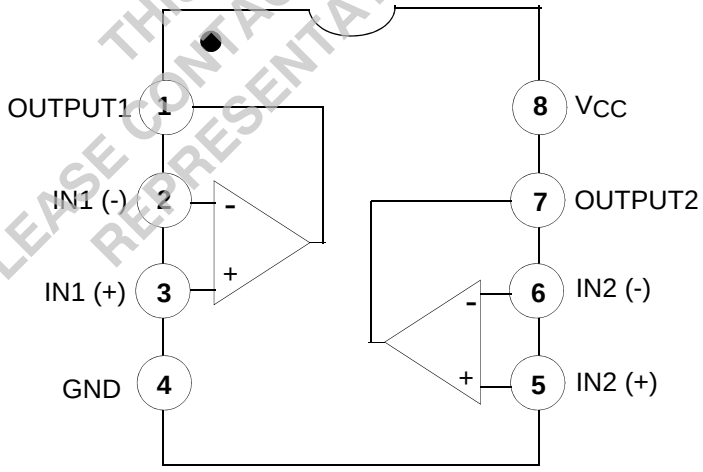
- Single Supply Operation: 2V to 36V
- Dual Supply Operation: ±1V to ±18V
- Allow Comparison of Voltages Near Ground Potential
- Low Current Drain 800μA Typ.
- Compatible with all Forms of Logic
- Low Input Bias Current 25nA Typ.
- Low Input Offset Current ±5nA Typ.
- Low Offset Voltage ±1mV Typ.

Description

The LM2903, LM393/LM393A, LM293A consist of two independent voltage comparators designed to operate from a single power supply over a wide voltage range.

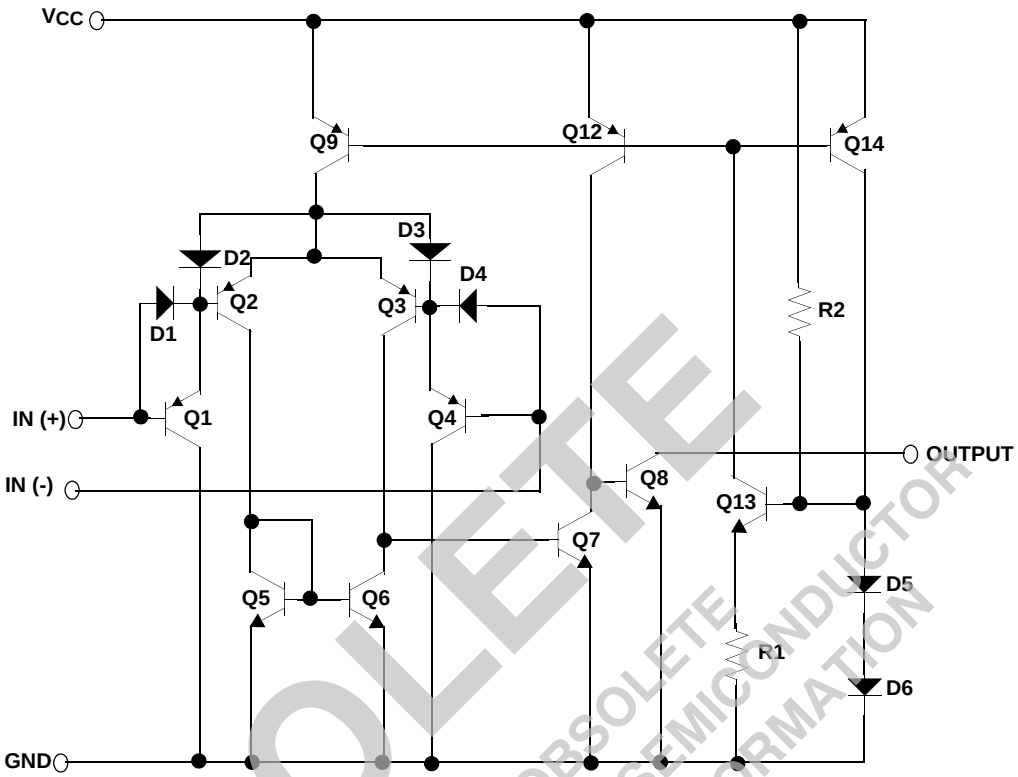


Internal Block Diagram



©2012 Fairchild Semiconductor Corporation

Schematic Diagram



OBSOLETE
THIS DEVICE IS OBSOLETE
PLEASE CONTACT YOUR ON SEMICONDUCTOR
REPRESENTATIVE FOR INFORMATION

Absolute Maximum Ratings

Parameter	Symbol	Value	Unit
Power Supply Voltage	V_{CC}	±18 or 36	V
Differential Input Voltage	$V_{I(DIFF)}$	36	V
Input Voltage	V_I	-0.3 to +36	V
Output Short Circuit to GND	-	Continuous	-
Power Dissipation, T_a = 25°C 8-DIP 8-SOIC	P_D	 1040 480	mW
Operating Temperature LM393/LM393A LM2903 LM293A	T_{OPR}	 0 ~ +70 -40 ~ +105 -25 ~ +85	°C
Storage Temperature	T_{STG}	-65 ~ +150	°C

Thermal Data

Parameter	Symbol	Value	Unit
Thermal Resistance Junction-Ambient Max. 8-DIP 8-SOIC	$R_{\theta ja}$	 120 260	°C/W

Electrical Characteristics

(V_{CC} = 5V, T_A = 25°C, unless otherwise specified)

Parameter	Symbol	Conditions		LM293A/LM393A			LM393			Unit
				Min.	Typ.	Max.	Min.	Typ.	Max.	
Input Offset Voltage	V_{IO}	$V_{O(P)}$ =1.4V, R_S = 0Ω		-	±1	±2	-	±1	±5	mV
		V_{CM}= 0 to 1.5V	Note1	-	-	±4.0	-	-	±9.0	
Input Offset Current	I_{IO}			-	±5	±50	-	±5	±50	nA
			Note1	-	-	±150	-	-	±150	
Input Bias Current	I_{BIAS}			-	65	250	-	65	250	nA
			Note1	-	-	400	-	-	400	
Input Common Mode Voltage Range	$V_{I(R)}$			0	-	V_{CC} -1.5	0	-	V_{CC} -1.5	V
			Note1	0	-	V_{CC}-2	0	-	V_{CC}-2	
Supply Current	I_{CC}	R_L = ∞ , V_{CC} = 5V		-	0.6	1	-	0.6	1	mA
		R_L = ∞, V_{CC} = 30V		-	0.8	2.5	-	0.8	2.5	
Voltage Gain	G_V	V_{CC} =15V, R_L ≥ 15kΩ (for large $V_{O(P-P)swing}$)		50	200	-	50	200	-	V/mV
Large Signal Response Time	T_{LRES}	V_I =TTL Logic Swing V_{REF} =1.4V, V_{RL} = 5V, R_L = 5.1kΩ		-	350	-	-	350	-	nS
Response Time	T_{RES}	V_{RL} =5V, R_L =5.1kΩ		-	1.4	-	-	1.4	-	µS
Output Sink Current	I_{SINK}	$V_{I(-)}$ ≥ 1V, $V_{I(+)}$ =0V, $V_{O(P)}$ ≤1.5V		6	18	-	6	18	-	mA
Output Saturation Voltage	V_{SAT}	$V_{I(-)}$ ≥ 1V, VI(+) = 0V		-	160	400	-	160	400	mV
		I_{SINK} = 4mA	Note1	-	-	700	-	-	700	
Output Leakage Current	$I_{O(LKG)}$	$V_{I(-)}$ = 0V, $V_{I(+)}$ = 1V	$V_{O(P)}$ = 5V	-	0.1	-	-	0.1	-	nA
			$V_{O(P)}$ = 30V	-	-	1.0	-	-	1.0	µA

Note1
LM393/LM393A: 0 ≤ T_A ≤ +70°C
LM2903: -40 ≤ T_A ≤ +105°C
LM293A : -25 ≤ T_A ≤ +85°C

OBSOLETE
THIS DEVICE IS OBSOLETE
PLEASE CONTACT YOUR ON SEMICONDUCTOR
REPRESENTATIVE FOR INFORMATION

Electrical Characteristics (Continued)

(V_{CC} = 5V, T_A = 25°C, unless otherwise specified)

Parameter	Symbol	Conditions		LM2903			Unit
				Min.	Typ.	Max.	
Input Offset Voltage	V_{IO}	$V_{O(P)}$ =1.4V, R_S = 0Ω		-	±1	±7	mV
		V_{CM}= 0 to 1.5V	Note1	-	±9	±15	
Input Offset Current	I_{IO}			-	±5	±50	nA
			Note1	-	±50	±200	
Input Bias Current	I_{BIAS}			-	65	250	nA
			Note1	-	-	500	
Input Common Mode Voltage Range	$V_{I(R)}$			0	-	V_{CC} -1.5	V
			Note1	0	-	V_{CC}-2	
Supply Current	I_{CC}	R_L = ∞, V_{CC} = 5V		-	0.6	1	mA
		R_L = ∞, V_{CC} = 30V		-	1	2.5	
Voltage Gain	G_V	V_{CC} =15V, R_L≥15kΩ (for large $V_{O(P-P)}$swing)		25	100	-	V/mV
Large Signal Response Time	T_{LRES}	V_I =TTL Logic Swing V_{REF} =1.4V, V_{RL} = 5V, R_L = 5.1kΩ		-	350	-	nS
Response Time	T_{RES}	V_{RL} = 5V, R_L = 5.1kΩ		-	1.5	-	μS
Output Sink Current	I_{SINK}	$V_{I(-)}$ ≥ 1V, $V_{I(+)}$ = 0V, $V_{O(P)}$ ≤ 1.5V		6	16	-	mA
Output Saturation Voltage	V_{SAT}	$V_{I(-)}$ ≥ 1V, $V_{I(+)}$ = 0V		-	160	400	mV
		I_{SINK} = 4mA	Note1	-	-	700	
Output Leakage Current	$I_{O(LKG)}$	$V_{I(-)}$ = 0V,	$V_{O(P)}$ = 5V	-	0.1	-	nA
		$V_{I(+)}$ = 1V	$V_{O(P)}$ = 30V	-	-	1.0	μA

Note1
LM393/LM393A: 0 ≤ T_A ≤ +70°C
LM2903: -40 ≤ T_A ≤ +105°C
LM293A : -25 ≤ T_A ≤ +85°C

OBSOLETE
THIS DEVICE IS OBSOLETE
PLEASE CONTACT YOUR ON SEMICONDUCTOR
REPRESENTATIVE FOR INFORMATION

Typical Performance Characteristics

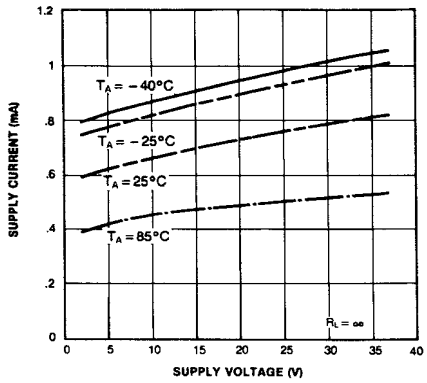


Figure 1. Supply Current vs Supply Voltage

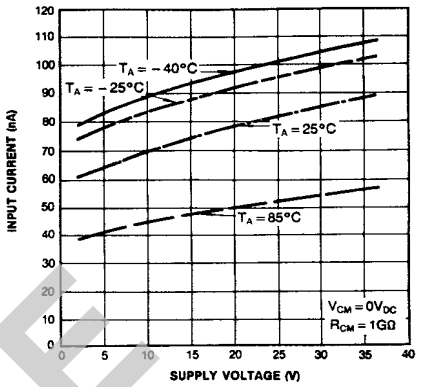


Figure 2. Input Current vs Supply Voltage

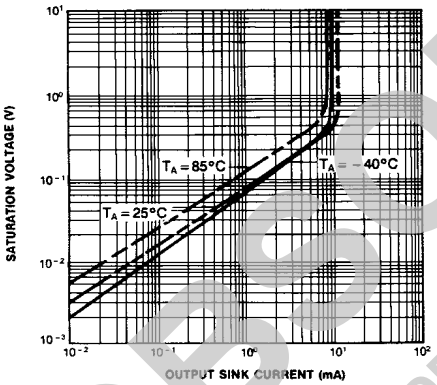


Figure 3. Output Saturation Voltage vs Sink Current

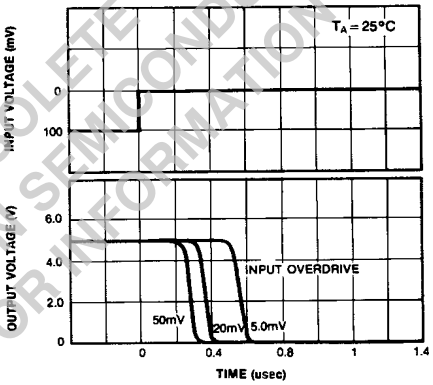


Figure 4. Response Time for Various Input Overdrive-Negative Transition

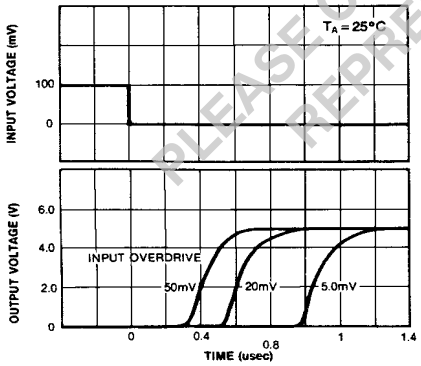


Figure 5. Response Time for Various Input Overdrive-Positive Transition

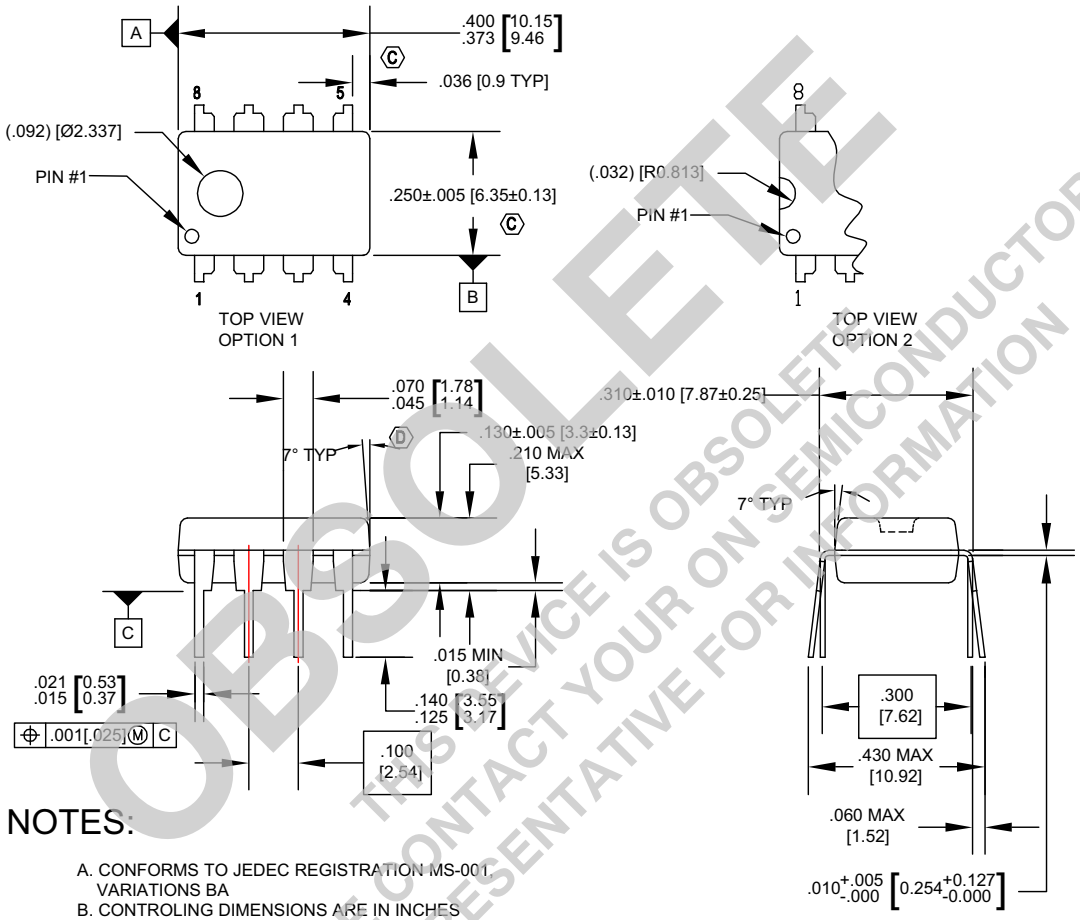
OBSOLETE
THIS DEVICE IS OBSOLETE
PLEASE CONTACT YOUR ON SEMICONDUCTOR
REPRESENTATIVE FOR INFORMATION

Mechanical Dimensions

Package

Dimensions in millimeters

8-DIP



NOTES:

A. CONFORMS TO JEDEC REGISTRATION MS-001, VARIATIONS BA
B. CONTROLING DIMENSIONS ARE IN INCHES REFERENCE DIMENSIONS ARE IN MILLIMETERS
C. DOES NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .010 INCHES OR 0.25MM.
D. DOES NOT INCLUDE DAMBAR PROTRUSIONS. DAMBAR PROTRUSIONS SHALL NOT EXCEED .010 INCHES OR 0.25MM.
E. DIMENSIONING AND TOLERANCING PER ASME Y14.5M-1994.

N08EREVG

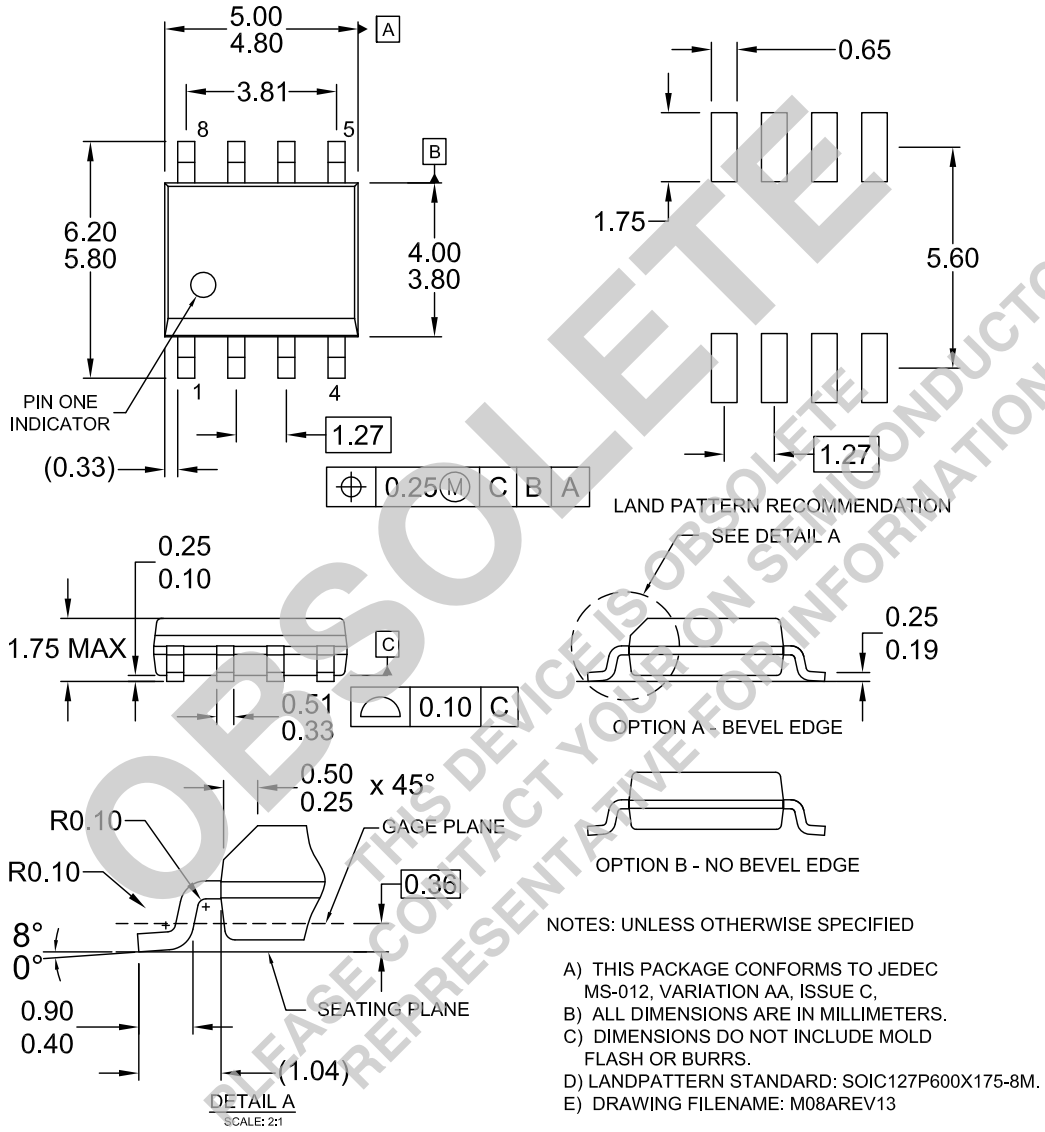
OBSOLETE
THIS DEVICE IS OBSOLETE
CONTACT YOUR ON SEMICONDUCTOR
REPRESENTATIVE FOR INFORMATION

Mechanical Dimensions (Continued)

Package

Dimensions in millimeters

8-SOIC



NOTES: UNLESS OTHERWISE SPECIFIED

A) THIS PACKAGE CONFORMS TO JEDEC MS-012, VARIATION AA, ISSUE C,
B) ALL DIMENSIONS ARE IN MILLIMETERS.
C) DIMENSIONS DO NOT INCLUDE MOLD FLASH OR BURRS.
D) LANDPATTERN STANDARD: SOIC127P600X175-8M.
E) DRAWING FILENAME: M08AREV13

OBSOLETE
THIS DEVICE IS OBSOLETE
PLEASE CONTACT YOUR ON SEMICONDUCTOR
REPRESENTATIVE FOR INFORMATION

Ordering Information

Product Number	Operating Temperature	Package	Packing Method
LM393N	0 ~ +70°C	8-DIP	Rail
LM393AN			Rail
LM393M		8-SOIC	Rail
LM393MX			Tape & Reel
LM393AM			Rail
LM393AMX			Tape & Reel
LM2903N	-40 ~ +105°C	8-DIP	Rail
LM2903M		8-SOIC	Rail
LM2903MX			Tape & Reel
LM293AN	-25 ~ +85°C	8-DIP	Rail

OBSOLETE
THIS DEVICE IS OBSOLETE
PLEASE CONTACT YOUR ON SEMICONDUCTOR
REPRESENTATIVE FOR INFORMATION

DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

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 of 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.

7/24/12 0.0m 001
Stock#DS400295
© 2012 Fairchild Semiconductor Corporation

OBSOLETE
THIS DEVICE IS OBSOLETE
PLEASE CONTACT YOUR ON SEMICONDUCTOR
REPRESENTATIVE FOR INFORMATION

ON Semiconductor and ON 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. 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

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**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative