



Is Now Part of



ON Semiconductor®

To learn more about ON Semiconductor, please visit our website at
www.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.



April 2015

FSA553

Dual SPST Depletion Audio Switch with Negative Swing

Features

- Dual SPST Depletion Switch
- Normally Closed when $V_{CC} < 0.2\text{ V}$
- Switches Configurable through Select Pins
- V_{SW} : -1.5 V to +1.5 V
- R_{ON} : 0.4 Ω (Typical)
- $R_{FLAT} < 0.01\ \Omega$ (Typical)
- THD+N: -104 dB (Typical)
- OIRR: -78 dB (Typical)

Description

The FSA553 is a high-performance dual single-pole single-throw (SPST x 2) audio switch. The Depletion technology allows the device to conduct signals when there is no V_{CC} available and to isolate signals when V_{CC} is present. During signal conduction, the Depletion gate control allows the FSA553 to achieve excellent THD+N performance while consuming minimal power.

Related Resources

- FSA553 Evaluation Board

Applications

- Smart Phones
- Tablets, Ultra Books

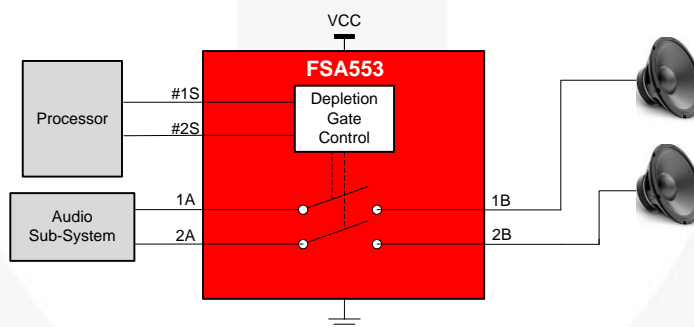


Figure 1. Application Block Diagram

Ordering Information

Part Number	Operating Temperature Range	Top Mark	Package	Packing Method
FSA553UCX	-40 to 85°C	NG	9-Ball WLCSP, 0.40 mm Pitch, 1.215 x 1.385 x 0.58 mm (Nominal)	3000 Units on Tape & Reel

Pin Configuration

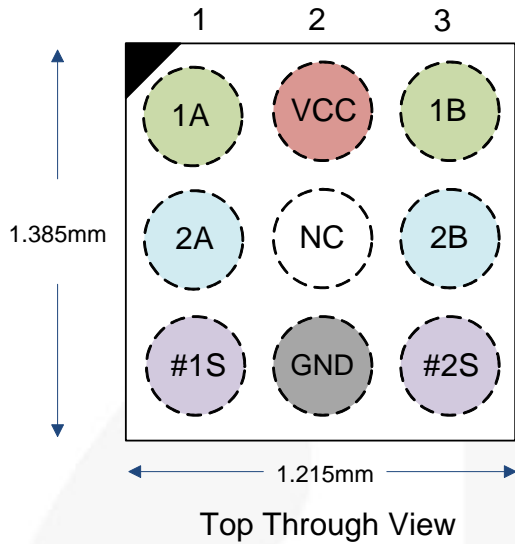


Figure 2. Top Through View

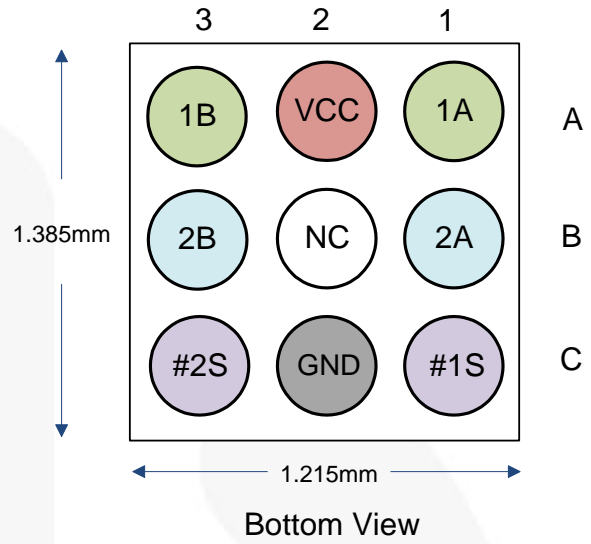


Figure 3. Bottom View

Pin Descriptions

Pin #	Name	Type	Description
A1	1A	Depletion I/O	A-Port of Switch 1 (Normally Closed)
A3	1B	Depletion I/O	B-Port of Switch 1 (Normally Closed)
C1	#1S	Control	Select to Enable/Disable SW1 (Enable LOW)
A2	V _{CC}	Power Supply / Control	Power Supply Input
B2	NC	No Connect	Do Not Connect
C2	GND	Ground	Ground
B1	2A	Depletion I/O	A-Port of Switch 2 (Normally Closed)
B3	2B	Depletion I/O	B-Port of Switch 2 (Normally Closed)
C3	#2S	Control	Select to Enable/Disable SW2 (Enable LOW)

Table 1. Switch Truth Table

V _{CC}	#1S	#2S	Switch 1	Switch 2
LOW	X	X	ON	ON
HIGH	HIGH	HIGH	OFF	OFF
HIGH	LOW	HIGH	ON	OFF
HIGH	HIGH	LOW	OFF	ON

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter		Min.	Max.	Unit
V _{CC}	Supply/Control Voltage		-0.5	4.3	V
V _{CNTRL}	Select Input Voltage	#1S, #2S	-0.5	4.3	V
V _{SW(ON)}	DC Switch I/O Voltage (Switch Conducting)	1A, 1B, 2A, 2B	-2.0	2.0	V
V _{SW(OFF)}	DC Switch I/O Voltage (Switch Isolated)	1A, 1B, 2A, 2B	-2.0	2.0	V
I _{SW}	Switch I/O Current	V _{CC} =0 V (Switch Conducting)		350	mA
I _{SWPEAK}	Peak Switch Current	Pulsed at 1 ms Duration, <10% Duty Cycle		500	mA
ESD	Human Body Model, ANSI/ESDA/JEDEC JS-001-2012	I/O Ports		7	kV
		All Other Pins		4	
	Charged Device Model, JEDEC: JESD22-C101			2	
	IEC 61000-4-2 System	Contact		8	
		Air Gap		15	
T _A	Absolute Maximum Operating Temperature		-40	+85	°C
Θ _{JA}	Thermal Resistance, Junction-to-Ambient	2S2P JEDEC std. PCB		97	°C/W
T _{STG}	Storage Temperature		-65	+150	°C

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. Fairchild does not recommend exceeding these ratings or designing to Absolute Maximum Ratings.

Symbol	Parameter		Min.	Max.	Unit
V _{CC(ON)}	Supply Voltage with Depletion Switch Conducting (1A=1B; 2A=2B)		0	0.2	V
V _{CC(OFF)}	Supply Voltage with Depletion Switch Isolated (1A≠1B; 2A≠2B; #1S=#2S=HIGH)		1.5	3.0	V
V _{SW(ON)}	DC Switch I/O Voltage	Switch Conducting	-1.5	1.5	V
V _{SW(OFF)}	DC Switch I/O Voltage	Switch Isolated	-1.5	1.5	V
V _{CNTRL}	Select Input Voltage	#1S, #2S	0	3.0	V

DC Electrical Characteristics

Unless otherwise specified, typical values are for $T_A=25^\circ\text{C}$.

Symbol	Parameter	Condition	V_{CC} (V)	$T_A=-40^\circ\text{C}$ to $+85^\circ\text{C}$			Unit
				Min.	Typ.	Max.	
$V_{CC(HYS)}$	Supply Voltage Hysteresis				450		mV
I_{ON}	Switch ON Leakage Current	nA=-0.5 V, 0.5 V, 1.5 V, -1.5 V, nB=Float, #1S=#2S=Float	0		0.1		μA
I_{OFF}	Switch OFF Leakage Current	nA=-0.5 V, 0.5 V, 1.5 V, -1.5 V, nB=GND, #1S=#2S= V_{CC}	1.8		0.5		μA
I_{CCT}	Increase in I_{CC} for each Select Pin	#1S= V_{CC} , #2S=1.2 V, #1S=1.2 V, #2S= V_{CC}	3.0		7		μA
R_{ON}	Switch On Resistance	$I_{SW}=100\text{ mA}$, $V_{SW}=-1.5\text{ V}$ to $+1.5\text{ V}$	0		0.40	0.80	Ω
ΔR_{ON}	Switch On Resistance Difference, Channel to Channel	$I_{SW}=100\text{ mA}$, $V_{SW}=-1.5\text{ V}$ to $+1.5\text{ V}$	0		0.01		Ω
$R_{FLAT(ON)}$	On Resistance Flatness	$I_{SW}=100\text{ mA}$, $V_{SW}=-1.5\text{ V}$ to $+1.5\text{ V}$	0		0.01		Ω
R_{PD}	V_{CC} Pull-Down Resistance		<0.2		5.0		M Ω
R_{PU}	Select Pull-Up Resistance		<0.2		3.0		M Ω
I_{CC}	Quiescent Supply Current	#1S=#2S=0 V or Float	Switch Isolated	1.5 – 3.0	80		μA
			Switch Conducting	0.2	0.5		
V_{IH}	Select Pin Input High Voltage		1.5 – 3.0	1.2			V
V_{IL}	Select Pin Input Low Voltage		1.5 – 3.0			0.55	V

AC Electrical Characteristics

Unless otherwise specified, typical values are for $T_A=25^\circ\text{C}$.

Symbol	Parameter	Condition	V_{CC} (V)	$T_A=-40^\circ\text{C to }+85^\circ\text{C}$			Unit	
				Min.	Typ.	Max.		
t_{ON}	Turn-On Time V_{CC} to Output	$R_L=32\ \Omega$, $C_L=10\ \text{pF}$, #nS=Float, Figure 4	$V_{SW}=1.5\ \text{V}$	1.8 → 0		450	μs	
			$V_{SW}=-1.5\ \text{V}$	1.8 → 0		350		
t_{OFF}	Turn-Off Time V_{CC} to Output	$R_L=32\ \Omega$, $C_L=10\ \text{pF}$, #nS=Float, Figure 4	$V_{SW}=1.5\ \text{V}$	0 → 1.8		250	μs	
			$V_{SW}=-1.5\ \text{V}$	0 → 1.8		150		
t_{ONS}	Turn-On Time Select Pin	$R_L=32\ \Omega$, $C_L=10\ \text{pF}$, #nS= $V_{CC} \rightarrow 0$, Figure 5	$V_{SW}=1.5\ \text{V}$	1.8		350	μs	
			$V_{SW}=-1.5\ \text{V}$	1.8		300		
t_{OFFS}	Turn-Off Time Select Pin	$R_L=32\ \Omega$, $C_L=10\ \text{pF}$, #nS=0 → V_{CC} , Figure 5	$V_{SW}=1.5\ \text{V}$	1.8		150	μs	
			$V_{SW}=-1.5\ \text{V}$	1.8		50		
BW	-3 dB Bandwidth	$V_{SW}=600\ \text{mV}_{p-p}$, $R_L=50\ \Omega$; $C_L=5\ \text{pF}$,	0			200	MHz	
THD+N	Total Harmonic Distortion + Noise	$V_{SW}=1\ V_{RMS}$, $R_L=32\ \Omega$, $f=1\ \text{kHz}$	Non A-weighted	0		-104	dB	
			A-weighted			-107	dB	
O_{IRR}	Port Off Isolation	$V_{SW}=0.707\ V_{RMS}$, $R_L=32\ \Omega$, $f=20\ \text{Hz to }100\ \text{kHz}$, Figure 6	1.8	-70		-82	dB	
X_{TALK}	Cross Talk	$V_{SW}=1\ V_{RMS}$, $f=100\ \text{kHz}$, $R_L=32\ \Omega$	1.8			-75	dB	
		$V_{SW}=1\ V_{RMS}$, $f=20\ \text{kHz}$, $R_L=32\ \Omega$				-100		
PSRR	Power Supply Rejection Ratio	Switch Isolating, $V_{Ripple}=V_{CC}+300\ \text{mV}_{p-p}$, $R_L=32\ \Omega$	217Hz	1.8			-80	dB
			1 kHz				-77	
			20 kHz				-73	

Capacitance

Unless otherwise specified, typical values are for $T_A=25^\circ\text{C}$.

Symbol	Parameter	Condition	V_{CC} (V)	$T_A=-40^\circ\text{C to }+85^\circ\text{C}$			Unit
				Min.	Typ.	Max.	
C_{ON}	On Capacitance	$V_{SW}=400\ \text{mV}_{PP}$, $f=1\ \text{MHz}$,	0		21		pF
C_{OFF}	Off Capacitance	$V_{SW}=400\ \text{mV}_{PP}$, $f=1\ \text{MHz}$, #1S=#2S= V_{CC}	1.8		25		pF
C_{CTRL}	Select Pin Capacitance	#nS= $400\ \text{mV}_{PP}$, $f=1\ \text{MHz}$,	1.8		5		pF

Timing Diagrams

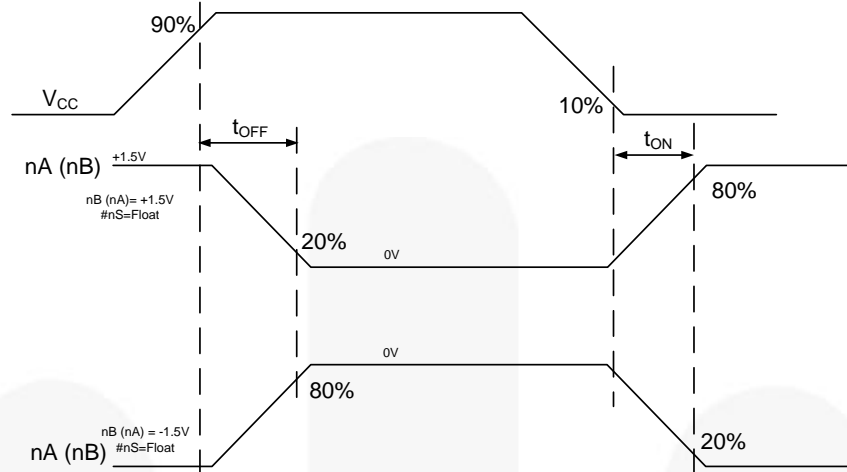


Figure 4. t_{ON}/t_{OFF} V_{CC} to Output Timing

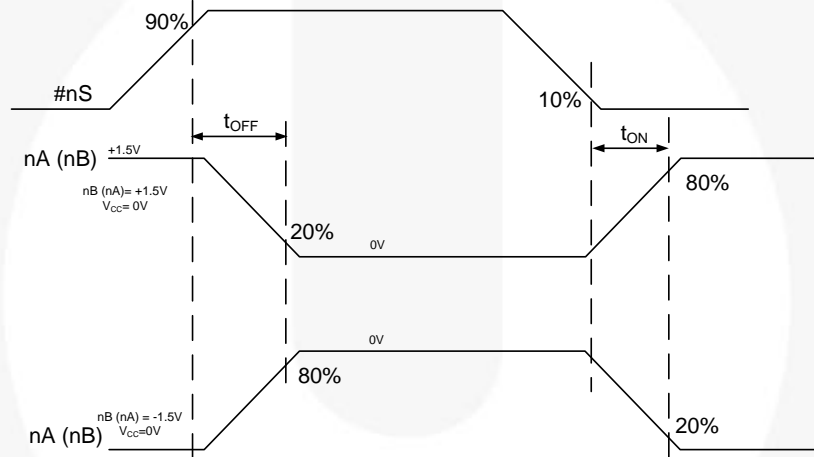
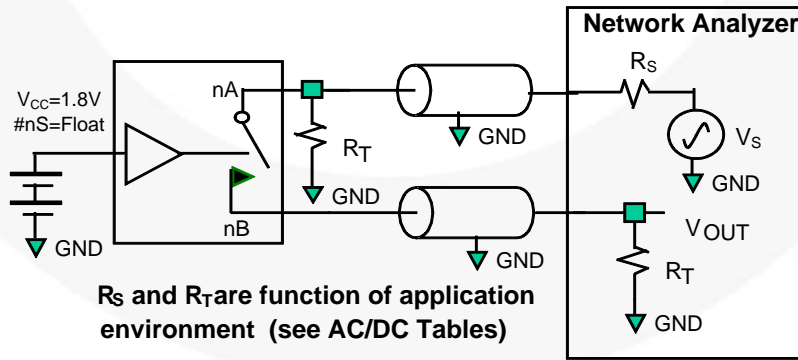


Figure 5. t_{ON}/t_{OFF} Select (#nS) to Output Timing



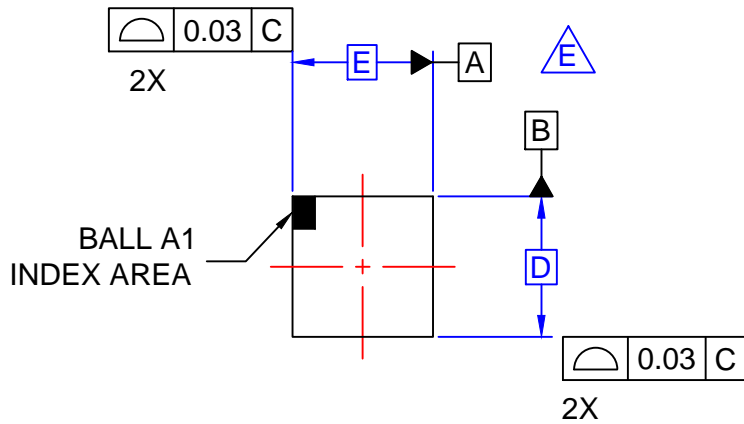
R_s and R_T are function of application environment (see AC/DC Tables)

$$\text{OFF Isolation} = 20 \text{ Log } (V_{OUT}/V_{IN})$$

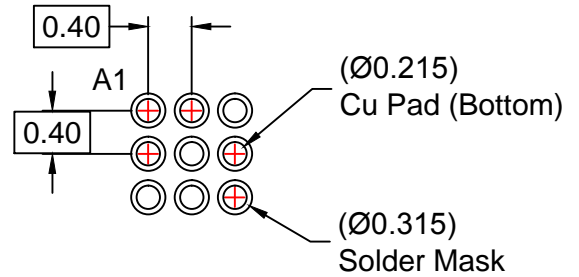
Figure 6. OFF Isolation

Product-Specific Dimensions

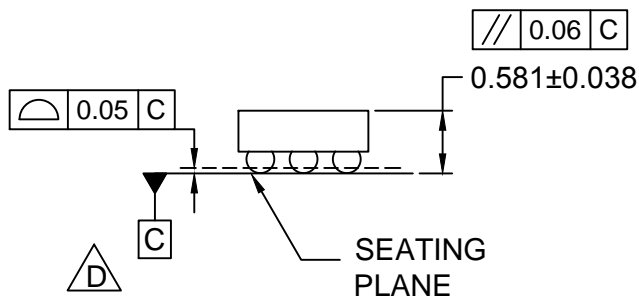
E	D	X	Y
1.215±.03 mm	1.385±.03 mm	0.2075 mm	0.2925 mm



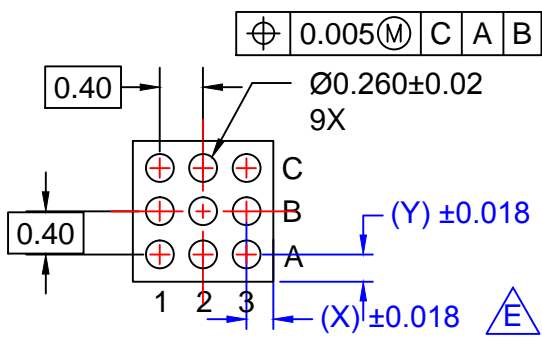
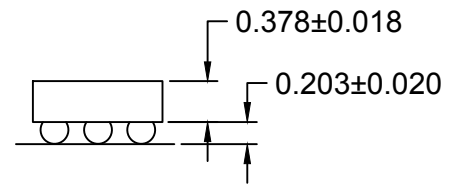
TOP VIEW



RECOMMENDED LAND PATTERN
(NSMD PAD TYPE)



SIDE VIEWS



BOTTOM VIEW

NOTES

- A. NO JEDEC REGISTRATION APPLIES.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS AND TOLERANCE PER ASME Y14.5M, 2009.
- D. DATUM C IS DEFINED BY THE SPHERICAL CROWNS OF THE BALLS.
- E. FOR DIMENSIONS D, E, X, AND Y SEE PRODUCT DATASHEET.
- F. DRAWING FILNAME: MKT-UC009Ak rev3

ON Semiconductor



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. 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

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

[Fairchild Semiconductor:](#)

[FSA553UCX](#)