

Auto-sensing bidirectional voltage level translators



Over the last decade semiconductor CMOS technology has advanced to produce high-performance systems with lower voltage and lower power I/O standards, especially in portable applications. This led to confrontation amongst engineers with an increasing complexity of modern portable electronic systems in which low power and voltage logic levels are used. Incompatibility between I/O levels becomes prevalent if different interface voltages are required within the system allowing safe communication between multiple devices without damage due to over voltage or other reasons.

When older legacy peripherals are used in multi-voltage applications, these higher voltage devices need to be interfaced with the lower voltages of the latest application processors that are used widely today. Nexperia's LSF switch-type translators enable these voltage translating interfaces and can be used for both open-drain and push-pull buffered applications.



Overview

Nexperia's Voltage Level Translators offer lower voltage and excellent performance in pin-to-pin compatible packages with industry-standard footprints. The LSF family comprises of dual supply, bidirectional voltage level translators operational from 0.95 V to 5.5 V allowing translation without the need for a direction pin in open-drain and push-pull applications. The LSF family supports level translation applications with transmission speed greater than 100Mbps for open drain utilizing a 30pF capacitance and 200ohm pull-up resistor. Minimal propagation delay and signal distortion for the connections to be made due to low RON, assuming higher voltage is on the B-side port.

Applications

- › Open-drain applications
 - I2C Bus, SMBus
 - PMBus
- › UARTs, HDMI, 1-wire sensor Bus
- › GPIO and other telecom infrastructure
- › Bluetooth headsets
- › Mobile and computing
- › Communications systems
- › Enterprise Systems
- › Automotive

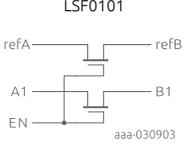
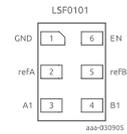
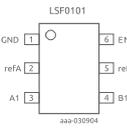
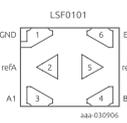
Key features

- › Complete family – comprising of 1,2,4 and 8-channel level translators
- › Easy to use – Dual supply translator family
- › Auto-sensing bidirectional voltage translation - no direction pin required
- › Low R_{ON} provides less signal distortion
- › High speed Up translation
 - ≤ 100 MHz; $CL = 30$ pF
 - ≤ 40 MHz; $CL = 50$ pF
- › High speed Down translation
 - ≥ 100 MHz; $CL = 30$ pF
 - ≤ 40 MHz; $CL = 50$ pF
- › Supports hot insertion
- › Bidirectional voltage level translation between:
 - 0.95 V and 1.8 V, 2.5 V, 3.3 V and 5.0 V
 - 1.2 V and 1.8 V, 2.5 V, 3.3 V and 5.0 V
 - 1.8 V and 2.5 V, 3.3 V and 5.0 V
 - 2.5 V and 3.3 V and 5.0 V
 - 3.3 V and 5.0 V
- › Low standby current
- › 5 V tolerant I/O pins to support TTL
- › Low R_{ON} provides less signal distortion
- › High-impedance I/O pins for $EN = Low$.
- › Flow-through pinout for easy PCB trace routing.
- › Specified from -40 °C to $+125$ °C

Product	Description	$V_{CC(A)}$ (V)	$V_{CC(B)}$ (V)	T_{amb} (°C)	Type(s)
LSF0101	1-bit bidirectional multi-voltage level translator; open-drain; push-pull	0.95 – 5.0	0.95 – 5.0	-40 °C to $+125$ °C	LSF0101GM, LSF0101GX, LSF0101GW**
LSF0102	2-bit bidirectional multi-voltage level translator; open-drain; push-pull	0.95 – 5.0	0.95 – 5.0	-40 °C to $+125$ °C	LSF0102DP, LSF0102DC, LSF0102GS, LSF0102GX, LSF0102DC-Q100, LSF0102DP-Q100
LSF0204	4-bit bidirectional multi-voltage level translator; open-drain; push-pull	0.8 – 5.0	0.8 – 5.0	-40 °C to $+125$ °C	LSF0204GU12, LSF0204PW, LSF0204PW-Q100
LSF0108	8-bit bidirectional multi-voltage level translator; open-drain; push-pull	0.95 – 5.0	0.95 – 5.0	-40 °C to $+125$ °C	LSF0108PW, LSF0108BQ, LSF0108BQ-Q100, LSF0108PW-Q100

- **In development

Packages

Functional diagram	Pinning configuration	SOT#	Package suffix	Package name	No of pins	Dimensions (L x W, pitch - in mm)	Package
 <p>LSF0101</p>	 <p>LSF0101</p>	SOT886	GM	XSON6	6	1 x 1.45, 0.5	
	 <p>LSF0101</p>	SOT363	GW	TSSOP6	6	2.1 x 2, 0.65	
	 <p>LSF0101</p>	SOT1255-2	GX	X2SON6	6	1 x 0.8, 0.8	

Packages

Functional diagram	Pinning configuration	SOT#	Package suffix	Package name	No of pins	Dimensions (L x W, pitch - in mm)	Package
<p>LSF0102</p> <p>refA refB</p> <p>A1 B1</p> <p>A2 B2</p> <p>EN</p> <p>aaa-031132</p>	<p>LSF0102</p> <p>GND 1 8 refB</p> <p>refA 2 7 B1</p> <p>A1 3 6 B2</p> <p>A2 4 5</p> <p>aaa-031133</p>	SOT1233-2	GX	X2SON8	8	1.35 X 0.8, 0.5	
	<p>LSF0102</p> <p>GND 1 8 EN</p> <p>refA 2 7 refB</p> <p>A1 3 6 B1</p> <p>A2 4 5 B2</p> <p>aaa-031134</p>	SOT1203	GS	XSON8	8	1.35 X 1, 0.55	
	<p>LSF0102</p> <p>GND 1 EN</p> <p>refA 2 refB</p> <p>A1 3 B1</p> <p>A2 4 B2</p> <p>aaa-031135</p>	SOT505-2	DP	TSSOP8	8	4 X 3, 0.65	
	<p>LSF0102</p> <p>GND 1 EN</p> <p>refA 2 refB</p> <p>A1 3 B1</p> <p>A2 4 B2</p> <p>aaa-031133</p>	SOT765-1	DC	VSSOP8	8	3.1 x 2, 0.5	
<p>LSF0204</p> <p>refA refB</p> <p>400 kΩ</p> <p>EN</p> <p>A_n B_n</p> <p>to other channels</p> <p>aaa-031585</p>	<p>LSF0204</p> <p>refA 1 refB</p> <p>A1 2 B1</p> <p>A2 3 B2</p> <p>A3 4 B3</p> <p>A4 5 B4</p> <p>n.c. 6 n.c.</p> <p>GND 7 EN</p> <p>aaa-031586</p>	SOT402-1	PW	TSSOP14	14	6.4 x 5, 0.65	
	<p>LSF0204</p> <p>terminal index area</p> <p>refA 1 refB</p> <p>A1 2 B1</p> <p>A2 3 B2</p> <p>A3 4 B3</p> <p>A4 5 B4</p> <p>aaa-031587</p>	SOT1174-1	GU12	XQFN12	12	2 x 1.7, 0.4	
<p>LSF0108</p> <p>refA refB</p> <p>A1 B1</p> <p>A2 B2</p> <p>A3 B3</p> <p>A4 B4</p> <p>A5 B5</p> <p>A6 B6</p> <p>A7 B7</p> <p>A8 B8</p> <p>EN</p> <p>aaa-030280</p>	<p>LSF0108</p> <p>terminal 1 index area</p> <p>refA 1 refB</p> <p>A1 2 B1</p> <p>A2 3 B2</p> <p>A3 4 B3</p> <p>A4 5 B4</p> <p>A5 6 B5</p> <p>A6 7 B6</p> <p>A7 8 B7</p> <p>GND(1) 9</p> <p>aaa-030282</p>	SOT764-1	BQ	DHVQFN20	20	2.5 x 4.5, 0.5	
	<p>LSF0108</p> <p>GND 1 EN</p> <p>refA 2 refB</p> <p>A1 3 B1</p> <p>A2 4 B2</p> <p>A3 5 B3</p> <p>A4 6 B4</p> <p>A5 7 B5</p> <p>A6 8 B6</p> <p>A7 9 B7</p> <p>A8 10 B8</p> <p>aaa-030281</p>	SOT360-1	PW	TSSOP20	20	6.4 x 6.5, 0.65	

© 2021 Nexperia B.V.

All rights reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Date of release:

February 2021

Printed:

In the Netherlands

