

# Welcome to the Texas Instruments New Product Update

We will begin promptly at 1 min past the hour- thank you for your patience  
Phone lines will be muted during the presentation.

*We've updated the Webex Audio and you can now get audio through the PC  
or have Webex call your phone.*

Please post questions on the chat Web-Ex Chat  
or contact your sales person or field applications engineer



# **Texas Instruments** **Multiplexers & Signal Switches**

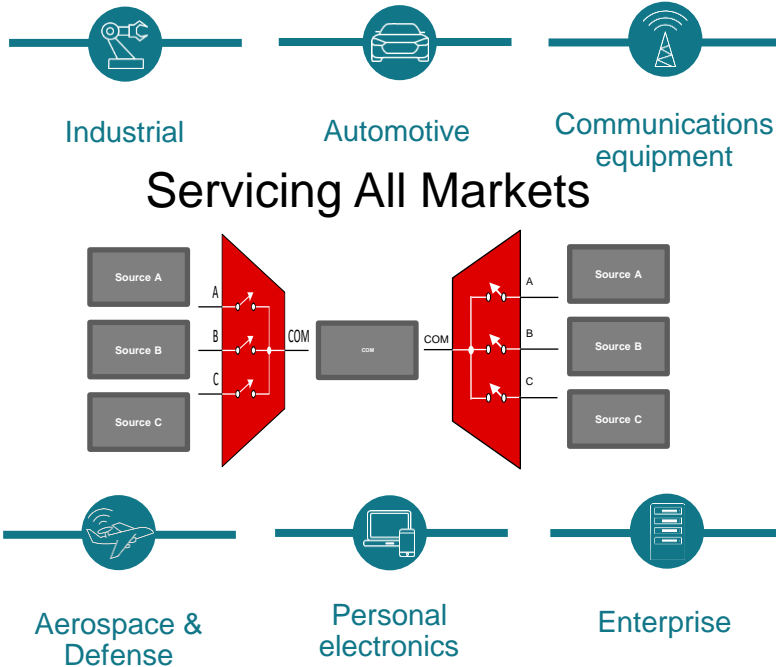
**Making Connections. Switching Things Around.**

**January 2020**

# Multiplexers & Signal Switches | Session Outline

- Introduction to the Portfolio
- Breadth of portfolio, Package & Technology
  - Precision
  - Protection
  - Low Voltage & Mid Voltage
  - **Industry's smallest** Leaded Package
- **New Technology investment**
- Introduction to TMUX Series of Multiplexers
- Low Voltage TMUX Series
  - **Low Leakage & Enhanced Protection** TMUXxx Parts
- Mid Voltage TMUX Portfolio
- Advanced notice on upcoming new products and early sample access
- **MSS Resources**

# TI | Multiplexers & Signal Switches



TI's industry-leading Multiplexers and Signal Switches offer differentiated performance in small size servicing all markets.

30+

- Years of experience

1200+

- Largest portfolio of Orderable part numbers and expanding

20K+

- Customers across all segments and application areas

99%

- Devices with LT < 12 weeks

60+

- Different package options
- **Industry's Smallest** Leaded Package (16 Pin, 0.5mm Pitch)

\$\$+

- Continued investment to expand portfolio

# Industry Leading | Precision & Protection

## Precision Multiplexers & Switches

*Preserve Signal Integrity*

## Protection Multiplexers & Switches

*Protect upstream and downstream components*

**Low On - Capacitance ( $C_{ON}$ )**  
*Parasitic capacitance when MUX is on*

**Improves Performance (Settling Time, Bandwidth)**

**Low Charge Injection ( $Q_{INJECTION}$ )**  
*Charge injected onto the switch output due to parasitic capacitance*

**Improves Accuracy (Offset Error)**

**Low On - Resistance ( $R_{ON}$ )**  
*Parasitic resistance when the switch is on*

**Improves Accuracy ( $\Delta$ Voltage)**

**Low On - Leakage ( $I_{ON}$ )**  
*Parasitic leakage intrinsic to the switch*

**Improves Accuracy (Offset Error)**

**Powered Off Protection**  
*Ensures the switch doesn't pass signals erroneously*

**Simplifies power sequencing**

**Latch-up Immunity**  
*Prevents current latch-up during operation*

**Improves system reliability**

**Over Voltage Protection**  
*Turns the switch off when the input voltage is too high*

**Protects downstream components**

# TI Packaging & Technology

# TI Technology | Package Differentiation

\*Standard Body Dimension

**1x Scale:**



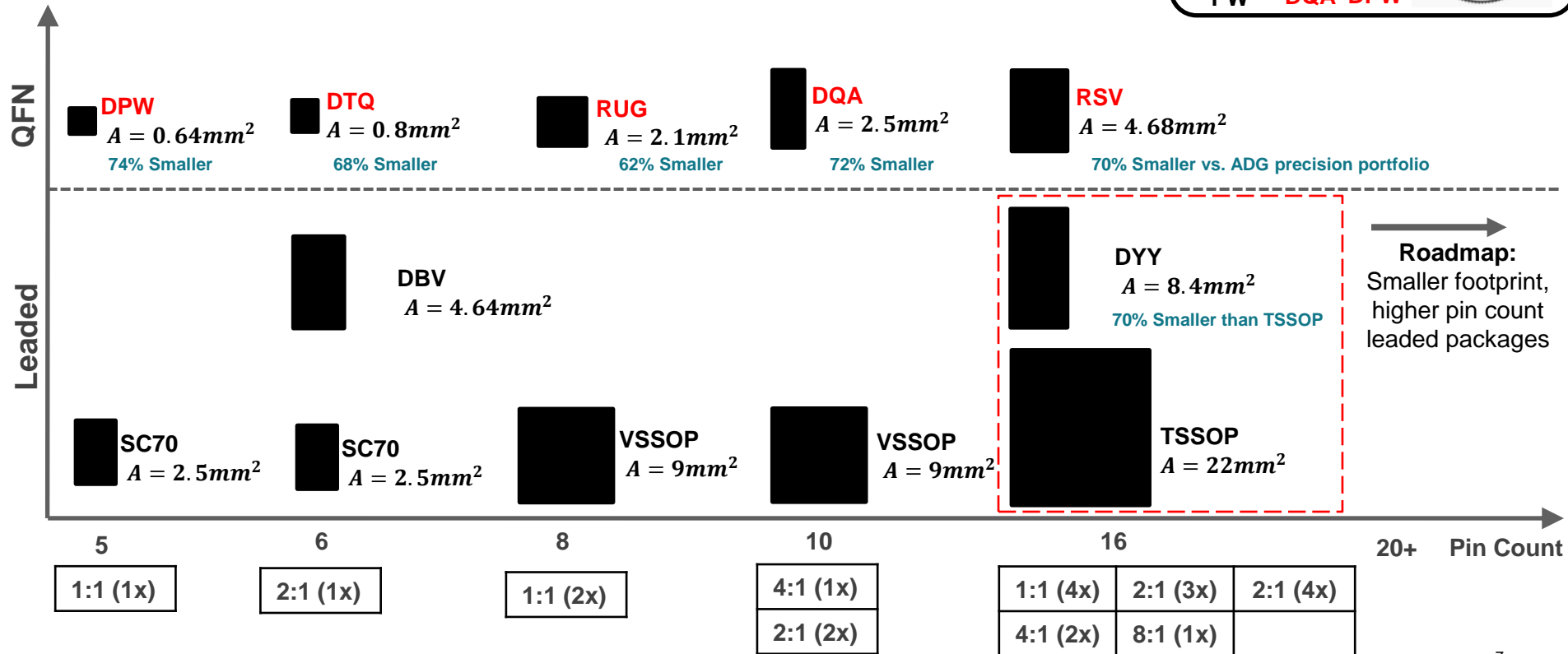
PW



DQA



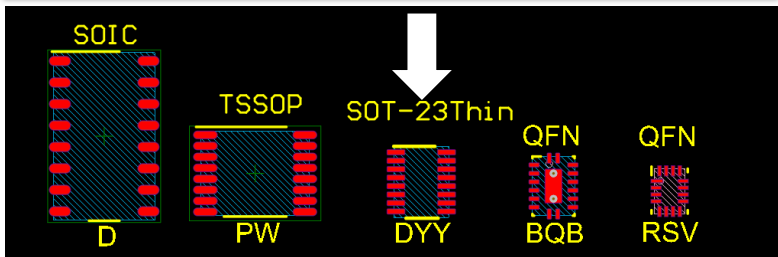
DPW



# TI Package Technology | SOT-23-THIN (DYY)

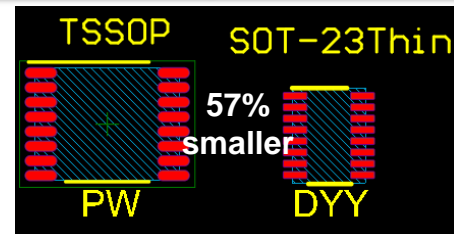
Industry's smallest 16-pin leaded packages

## TI 16 Pin packages

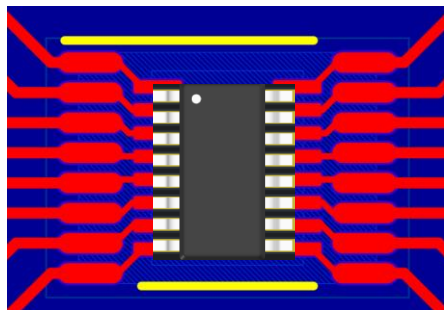


## SOT-23 Thin vs. TSSOP – 57% space savings

	SOT-23 Thin (DYY)	TSSOP (PW)
D (length)	4.2 mm	5.0 mm
E (width)	3.2 mm	6.4 mm
Pitch	0.5 mm	0.65 mm
Area (With Lead)	13.7 mm <sup>2</sup>	32.0 mm <sup>2</sup>
Area (W/O Lead)	8.4 mm <sup>2</sup>	22.0 mm <sup>2</sup>



## SOT-23 Thin fits inside TSSOP footprint

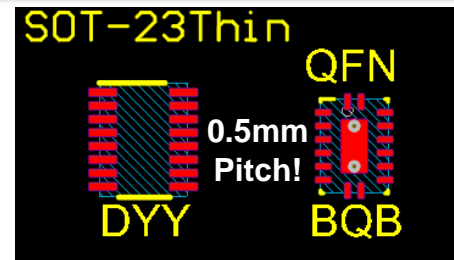


Dual footprint option  
SOT-23 Thin will fit inside TSSOP footprint and can be dual routed using conventional PCB design rules.

## SOT-23-THIN vs. QFN – QFN size with leaded reliability

### QFN size with leaded reliability

- SOT-23 Thin package achieves small QFN size and maintains 0.5mm pitch.
- SOT-23 thin is a QFN alternative for space constrained designs with the added benefits of optical inspection, easier debug, and mechanical reliability of a leaded package





# WHY TI MUX

- **Largest Portfolio** of General Purpose MUXes
- Broad Selection from Low & Mid Voltage

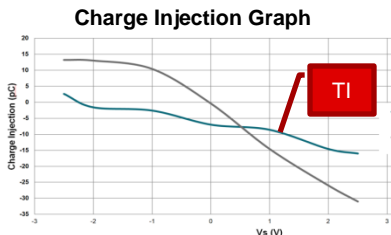
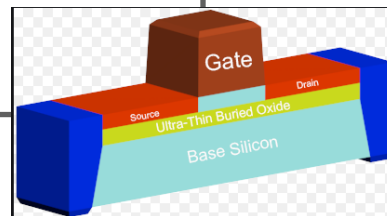
Simplify signal switching with our **analog switches & multiplexers**

Enhance system capabilities and optimize your BOM

Largest Portfolio

Technology SOI

- State of the Art “Silicon on Insulator” Technology
- **Higher voltage** support without sacrificing Ron
- **Latch-up immunity**
- Wide temperature support - 40C to 125C
- **Robust ESD**



- **Lowest & flattest charge Injection**
- **Integrated fault protection** with zero overshoot
- Miswiring immunity

IP

Support

- 24x7 Technical support through (**E2E™**) portal supported by Qualified Engineers
- **TI E2E™ support forums**
- Searchable database
- 3000 TI reference designs



# Multiplexers & Switches | Key Features

	I/O Signal voltage ( $\leq \pm 24V$ )	I/O signal voltage ( $> \pm 24V$ )	Automotive qualified	Small package size
High precision (< 1-nA leakage current)	<a href="#">TMUX11x</a>	<a href="#">TMUX61x</a>	<a href="#">TS3A3159-Q1</a>	<a href="#">TMUX11x</a>
<b>Powered-off protection</b>	<a href="#">TMUX15x</a>	<a href="#">MPCx</a>	<a href="#">SN3257-Q1</a>	<a href="#">TS5A12301E</a>
Low ON-state resistance ( $R_{on} < 1 \Omega$ )	<a href="#">TS5Ax</a>		<a href="#">TS5Ax-Q1</a>	<a href="#">TS5A3159A</a>
Low capacitance ( $C_{on} < 10 \text{ pF}$ )	<a href="#">TMUX15x</a>	<a href="#">TMUX61x</a>	<a href="#">SN3257-Q1</a>	<a href="#">SN74LVCx</a>
<b>Support for 1.8-V logic</b>	<a href="#">TMUX12x</a>		<a href="#">TS3A27518E-Q1</a>	<a href="#">TS5A21366</a>
Support for JTAG, SPI, I2C and other protocols	<a href="#">TMUX1574</a>		<a href="#">TS5A23157-Q1</a>	<a href="#">TMUX1574</a>

## Protection

Isolate I/O signal paths, simplify power sequencing design complexity and protect components using powered-off, overvoltage and undershoot protection.

## Precision

Minimize offset error and signal distortion in high-accuracy measurement systems using < 1-nA leakage current and < 10-pC charge injection across the entire operating temperature range.

## Low voltage

Select from a comprehensive portfolio of low-voltage multiplexer configurations and package options to support an I/O signal range less than or equal to 24 V.

## Mid voltage

Maintain system accuracy and increase system voltage margin with mid-voltage multiplexers to support an I/O signal range greater than 24 V.

# TMUX Features | Fail-safe Logic

## Feature Description

TI switches with Fail-safe Logic will protect downstream components when a logic signal is present in the select (SEL) pins while the switch is unpowered. The switch maintains in a high-impedance state on the SEL logic pins **preventing power from going through  $V_{DD}$  during power sequencing.**

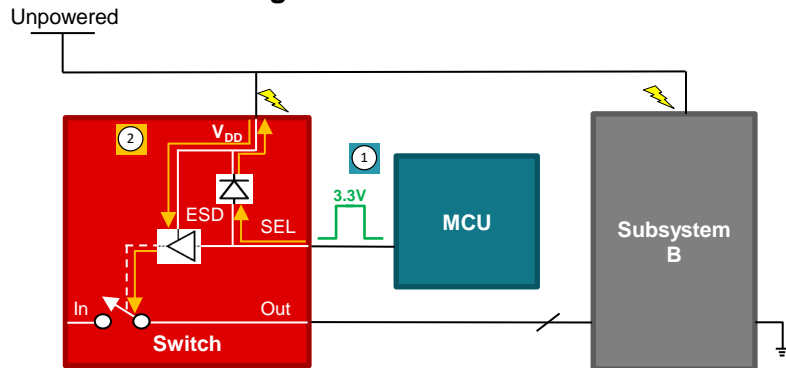
## Benefits

- Protects mux and downstream ICs from damage
- Eliminates need for power sequencing solutions
  - Reduces BOM count and cost
  - Simplifies system design
  - Improves system reliability

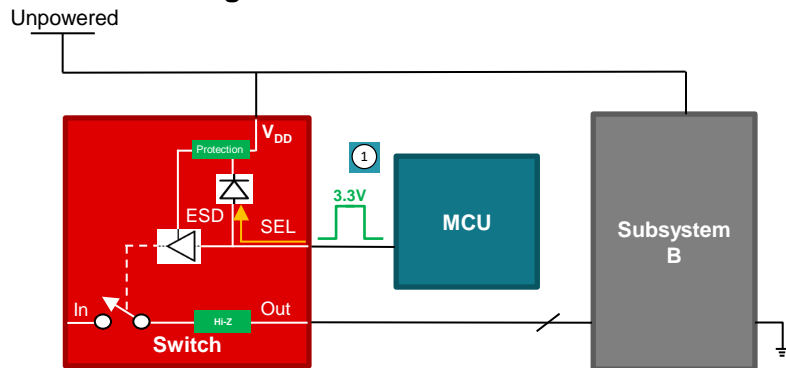
**Standard low-voltage TMUX feature!**

- 1 The MCU transmits a 3.3V logic signal to the switch select (SEL) when the switch is **OFF**
- 2 The 3.3V logic signal back-powers  $V_{DD}$ , back-powering Subsystem B and turning the switch **ON**

### Switch **without** fail-safe logic:



### Switch **with** fail-safe logic:



# TMUX Features

## Powered-off Protection

### Feature Description

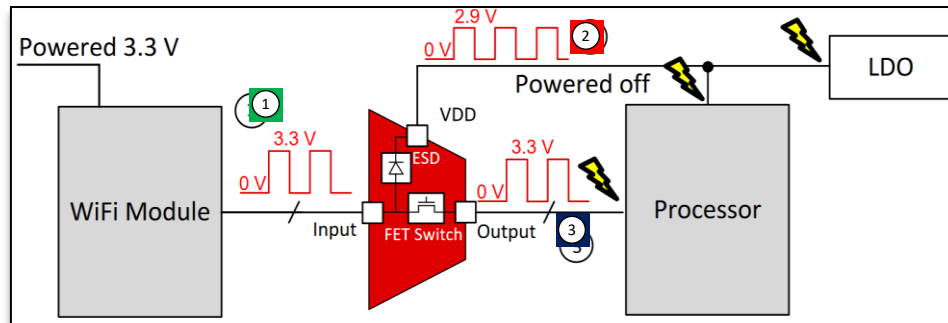
TI switches with [powered-off protection](#) will protect downstream components when input signals are present in the [I/O pins](#) while the switch is **unpowered**. The switch maintains a high-impedance state on the I/O pins which **prevents back-powering  $V_{DD}$  and the Select (SEL) pin**.

### Benefits

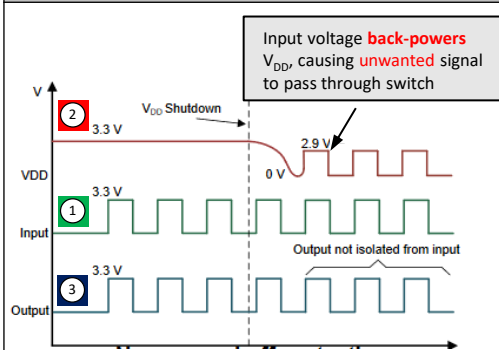
- Provides electrical isolation between subsystems
- Prevents data from being transmitted unintentionally
- Eliminates need for power sequencing solutions
  - Reduces BOM count and cost
  - Simplifies system design
  - Improves system reliability

Learn more about how to eliminate power sequencing issues [here!](#)

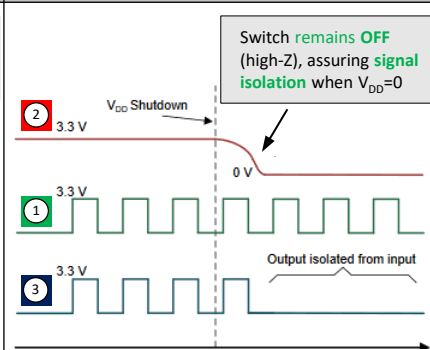
- 1 Subsystem A transmits a 3.3V signal to the switch input when the switch is **OFF**
- 2 The 3.3V signal back-powers the unpowered switch through the ESD diode, unintentionally turning the switch **ON**
- 3 The 3.3V unwanted signal is transmitted through the switch, damaging the system.



### Switch **without** powered-off protection



### Switch **with** powered-off protection



# Low Voltage $V_{\text{SIGNAL}} < 24\text{V}$ Multiplexers & Signal Switches

# Selection Guide | Low Voltage $V_{\text{SIGNAL}} < 24\text{V}$

Configuration	8:1	<p>TMUX1108 TMUX1208 TMUX1308 SN74LV4051 *CD4051 SN74LV4051</p>			
	4:1	<p>TMUX1104 TMUX1204</p>	<p>TMUX1109 TMUX1209 TMUX1309 SN74LV4052 SN74CBT3253 TS5A5017 *CD4052</p>		
	2:1	<p>TMUX1119 TMUX1219 TMUX1247 SN74LVC3157 TS5A3159</p>	<p>TMUX1136 TMUX136 TMUX154E TMUX1072 TS5A23157/59 TS5A22364</p>	<p>TMUX1133 SN74LV4053A CD74HC4053 *CD4053</p>	<p>TMUX1134 TMUX1574 TS3A44159 SN74CBTLV3257</p>
	1:1	<p>TMUX1101 TMUX1102 SN74LVC1G66 TS5A3166</p>	<p>TMUX1121 TMUX1122 TMUX1123 SN74LVC2G66 TS5A2066 TS5A21366</p>	<p>TMUX1111 TMUX1511 TMUX1311 SN74CBTLV3125 SN74HC4066 *CD4066</p>	
		1	2	3	4
Number of Channels					

Precision

Protection

General Purpose  
\*CD : up to 20V Supply

## TMUX Key Differences

	Precision	Protection	General Purpose
Ultra Low Leakage (pA)	✓	–	–
Powered-off Protection	–	✓	–
Overvoltage Protection	–	✓	–
1.8V Logic Control	✓	✓	✓
Fail-safe Logic	✓	✓	✓
Smallest QFN packages	✓	✓	✓
TI Device Families:	TMUX11xx	TMUX15xx	TMUX12xx, TMUX13xx

## TMUXXXXXX Nomenclature

1st Digit	2nd Digit	3rd & 4th Digit	Final Letter
Supply Range	Product Family Generation	Channel Count & Configuration	Key Differentiation

# Low Voltage | TMUX11xx Family

1.08V to 5.5V /  $\pm 2.5V$  Supply/Inputs | Low Leakage Precision Multiplexer

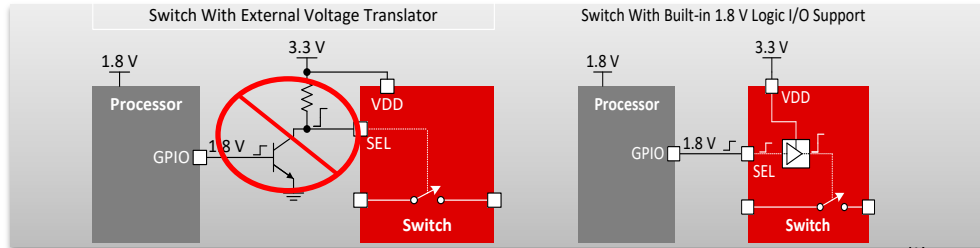
## Features

- 1.08V to 5.5V Single Supply Voltage
  - $\pm 2.5V$  Dual Supply
  - 1.8V Control Logic
- **Ultra Low ON Leakage:** 3pA (typ.), 5nA (max.)
- **Low Charge Injection:** 1.5pC (typ.)
- Low  $R_{ON}$ : 2 $\Omega$  (typ.)
  - $R_{ON}$  flatness: 0.8 $\Omega$  (typ.)
- Fail-safe Logic
- Fast Switching (ON/OFF) Time: 25ns (max.)
- Temperature Range: -40° to +125°C
- Ultra small packages:
  - DQA (2.5mm<sup>2</sup>), RSV (4.68mm<sup>2</sup>)
  - P2P in larger packages (TSSOP, DGK)

## Applications

- Test & Measurement – Data Acquisition Systems.
- Field Transmitter, PLC – Analog Input Module
- Medical – Ultrasound scanners, Bedside Monitors, BGM
- Sample & Hold
- Baseband Units (BBUs)

Device	$V_{DD}$	Config.	#Ch.	Samples	RTM	Competition
TMUX1108	1.08V – 5.5V (Single) $\pm 2.5V$ (Dual)	8:1	1	<a href="#">Available</a>	✓	ADG708 / 758 ADG728 / 738
TMUX1109	1.08V – 5.5V (Single) $\pm 2.5V$ (Dual)	4:1	2	<a href="#">Available</a>	✓	ADG709 / 759 ADG729 / 739
TMUX1104	1.08V – 5.5V (Single)	4:1	1	<a href="#">Available</a>	✓	ADG704
TMUX1119	1.08V – 5.5V (Single)	2:1	1	<a href="#">Available</a>	✓	ADG719 / 749 ADG779 / 752
TMUX1134	1.08V – 5.5V (Single) $\pm 2.5V$ (Dual)	2:1	4	<a href="#">Available</a>	✓	ADG734 / 788 ADG774 / 784
TMUX1133	1.08V – 5.5V (Single) $\pm 2.5V$ (Dual)	2:1	3	<a href="#">Available</a>	✓	ADG733 / 786
TMUX1136	1.08V – 5.5V (Single)	2:1	2	<a href="#">Available</a>	✓	ADG736
TMUX1111/12/13	1.08V – 5.5V (Single)	1:1	4	<a href="#">Available</a>	✓	ADG711 / 712 / 713 ADG781 / 782 / 783
TMUX1121/22/23	1.08V – 5.5V (Single)	1:1	2	<a href="#">Available</a>	✓	ADG721 / 722 / 723
TMUX1101/02	1.08V – 5.5V (Single)	1:1	1	<a href="#">Available</a>	✓	ADG701 / 702 ADG741 / 742



# TMUX1108 | vs Competition

Parameter	Competition A	TMUX1108	Customer Value
Configuration	8:1, 1 Channel	<b>8:1, 1 Channel</b>	
Operating Voltage	1.8V to 5.5V	1.08V to 5.5V	30% lower $V_{DD}$ support for next-gen roadmap
On-Leakage @125C	6nA	5nA	Better system accuracy
Con	96pF	80pF	20% lower → enables faster system sampling
Charge Injection ( $Q_c$ )	3pC	1.5pC	50% lower → enables faster acquisition time
$R_{on}$ @125C	7 $\Omega$	5 $\Omega$	20% lower → enables lower distortion/error (flatness)
$V_{IH}$ (Logic Level) @5Vdd	2.4V	1.4V ( <i>1.8V IO compatible</i> )	Eliminates level-translator device for 4 control IO pins
Smallest Package Size	16mm <sup>2</sup> (4x4 QFN)	4.68mm <sup>2</sup> (2.6x1.8 QFN)	70% smaller (PCB real-estate saving)
Fail-safe IO (logic pins)	No	Yes	Eliminate supply-sequencing constraints
125C Support	TSSOP only (QFN 85C)	TSSOP & QFN	Compact solution for auto/industrial applications
ESD (HBM)	Not published	2kV	Robust ESD protection

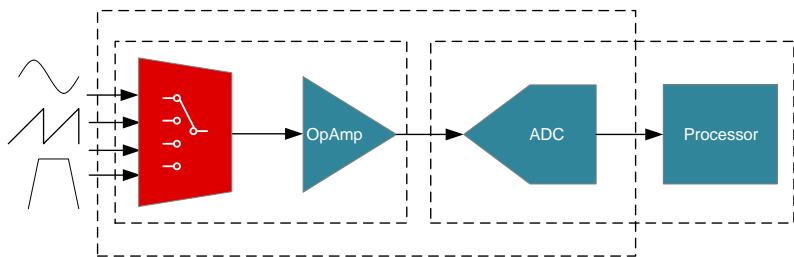
TI Advantage holds across all configurations



# ADC Input Sharing

**Problem Statement:** Need to monitor multiple sensors by one ADC

## Simplified Block Diagram:



## Key Specs

- Signal Voltage Range: Single supply or Dual supply (depending on the voltage range of the signal from all sensors)
- Channel & Configuration (Differential or single ended sensors)
- Low On Resistance (enables lower distortion & better linearity)
- **On Leakage Current** (Impacts the system accuracy)
- **Low Charge Injection** (enables faster acquisition time)
- Low On Capacitance (enables faster system sampling)

Hero Devices	Signal Voltage Range (V)	Channel	Config.	Ron ( $\Omega$ )	On Leakage current (25C)	Charge Injection ( $Q_{INJ}$ )	On Capacitance (pF)	BW (MHz)
<a href="#">TMUX1108/9</a>	0~5.5V or $\pm 2.75V$	1 / 2	8:1 / 4:1	2.5 $\Omega$ / 1.8 $\Omega$	3pA (typ)	-1 pC (typ.)	65/ 38	90 / 135
<a href="#">TMUX1208/9</a>	0~5.5v	1 / 2	8:1 / 4:1	5 $\Omega$	200nA (typ)	$\pm 9$ pC (typ.)	85/ 42	65 / 125
<a href="#">CD74HC4051/2</a>	0~ 10V	1 / 2	8:1 / 4:1	40 $\Omega$	200 nA	N/A	25/ 12	200
<a href="#">CD4051B/2</a>	0~20 or $\pm 10V$	1 / 2	8:1 / 4:1	125 $\Omega$	300 nA	N/A	30/ 18	20
<a href="#">MUX506/7/8/9</a>	0~36 or $\pm 18V$	1 / 2	16:1 / 8:1	125 $\Omega$	10pA (typ)	0.3 pC (typ.)	14/ 9/ 9/ 7	500
<a href="#">MUX36S08/D04</a>	0~36 or $\pm 18V$	1 / 2	8:1 / 4:1	125 $\Omega$	1pA (typ)	0.3 pC (typ.)	9.4 / 6.7	410 / 650
<a href="#">MUX36S16/D08</a>	0~36 or $\pm 18V$	1 / 2	16:1 / 8:1	125 $\Omega$	1pA (typ)	0.31 pC (typ)	13.5 / 8.7	360 / 420

# Low Voltage | TMUX1308 / 1309

1.62V to 5.5V Supply/Inputs | 1.8V Logic Support

Sampling: NOW

Production: 2Q20

## Features

- 1.62V to 5.5V Operating Supply Voltage
  - [1.8V Control Logic](#)
  - Rail-to-rail Operation ( $V_{IN} \leq V_{DD}$ )
- Current-Injection Control
- [Fail Safe Logic](#)
- Low  $R_{ON}$ : 59 $\Omega$  (typ.)
- Low  $C_{ON}$ : 20pF
- Bidirectional Signal Path
- Temperature Range: -40° to +125°C
- Available in [Automotive \(Q1\)](#) Version
- Packages:
  - **SOT-23-THIN (DYY)** (4.2mm x 3.26mm)
  - TSSOP (PW) (6.4mm x 5mm)
  - DQFN (BQB) (3.5mm x 2.5mm)

## Applications

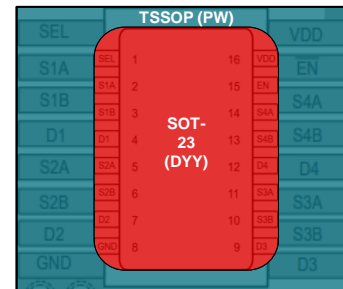
- Battery management systems (BMS)
- Building automation (HVAC)
- Factory automation (PLC)
- Communications Equipment

## Benefits

- Wide voltage range ideal for 1.8V, 3.3V and 5V applications
- [1.8V Control Logic](#) enables forward compatibility with low voltage processors and MCUs
- Current injection control feature, protects output from current pulses on unselected channel, simplifying protection circuitry
- [Fail Safe Logic](#) maintains a high impedance state in the SEL and EN pins, preventing back-powering the mux.
- Configurations (8:1, 4:1) make the mux ideal for I/O expansion
- SOT-23-THIN is the smallest 16-pin leaded package in the industry

Config.	Device	Samples	Competition
8:1 (1ch)	TMUX1308	4Q19	74HC4851 74LV4051A
4:1 (2ch)	TMUX1309	4Q19	74HC4852 74LV4052

★ 0.5mm pitch



Smallest 16-pin leaded package in the industry!

Save >50% of board space over TSSOP packages

# TMUX1308-Q1 | Competitive Landscape

Vendor	Texas Instruments	Texas Instruments	Competition N	Competition O	Competition S
Part Number	TMUX1308	SN74HC4851	HC4851	HC4851	HC4851
Operating Supply Voltage	1.62 to 5.5 V	2 V to 6 V	2 V to 6 V	4.5 V to 5.5 V	2 V to 6 V
R <sub>ON</sub> 25°C (typ) (Ω)	59	150	59	400	150
R <sub>ON</sub> 125°C (max) (Ω)	270	270	270	750	270
1.8-V Compatible I/O	Yes	No	No	No	No
Fail-Safe Logic	Yes	No	No	No	No
Current injection control	Yes	Yes	Yes	Yes	Yes
Back-powering Protection	Yes	No	No	No	No
Temp Range (°C)	-40 to 125°C	-40 to 125°C	-40 to 125°C	-40 to 125°C	-40 to 125°C
Package Size	DYY, PW, QFN	SOIC, PW, QFN	SOIC, PW, QFN	SOIC, PW, QFN	SOIC, PW, QFN

\*Values from +5V supply specifications

# Low Voltage | TMUX1511 / 1574

Enhanced Protection Multiplexer 1:1 / 1:2 (4-ch.)

Sampling Now!

Production NOW

## Features

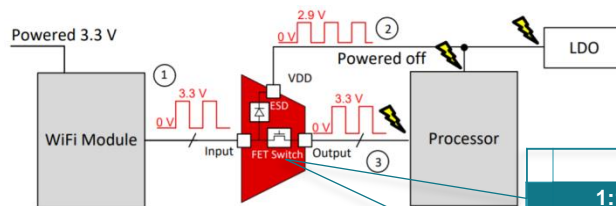
- 1.5V to 5.5V Operating Supply Voltage
  - 1.8V Compatible Control Inputs (I/O)
- 4-Channel Circuit:
  - TMUX1511: single-pole single-throw (1:1) (SPST)
  - TMUX1574: single-pole double-throw (1:2) (SPDT)
- Protection Features:
  - **Powered-off Protection**
  - Fail Safe Logic
- Precision Features:
  - Low  $R_{ON}$ : 3.5 $\Omega$  (max.)
  - Low  $C_{ON}$ : 5pF (typ.) / 10pF (TMUX1574)
- Temperature Range: -40° to +125°C
- Packages:
  - TSSOP (PW) (5mm x 4.4mm)
  - QFN (RSV) (2.6mm x 1.8mm)

## Applications

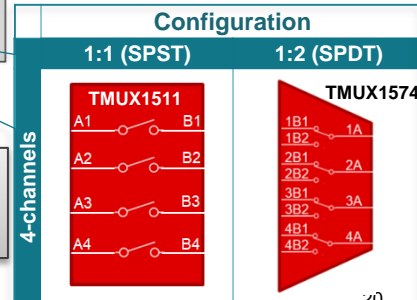
- Servers
- Data Center Switches
- Building Automation
- PC Notebook/Tablets
- Automotive Infotainment and Cluster (Auto BOM Ready)

## Benefits

- Wide voltage range ideal for 1.8V, 3.3V and 5V applications
- Powered-off protection feature isolates I/O signal paths from system power rails, simplifying power sequencing design
- 1.8V Control Logic enables forward compatibility with low voltage processors and MCUs
- Low  $C_{ON}$  supports faster rise and fall times with minimum edge and phase distortion
- **Smallest** 4 channel QFN package for in the industry



TMUX15xx **powered-off protection** feature prevents unintentional back-powering the mux power rail by isolating the I/O signal path



# TMUX15xx vs. Competition

TMUX15xx is not simply *pin-to-pin*... It is **SUPERIOR!**

Vendor	Texas Instruments	Competitor A	Competitor B
Part Number	<b>TMUX1511</b>	xx3125	xx3125
Operating Supply Voltage	1.5 to 5.5V	2.3 to 3.6V	2.3 to 3.6V
1.8-V Compatible I/O	Yes	No	No
R <sub>ON</sub> (max) (Ω)	3.5	60	60
C <sub>ON</sub> (pF)	5	14.3	10
Bandwidth (MHz)	1000	406	400
Powered-off Protection	Yes	Yes	Yes
Temp Range (°C)	-40 to 125°C	-40 to 125°C	-40 to 85°C
Smallest Package Size	4.68mm <sup>2</sup> (2.6 x 1.8 QFN)	7.5mm <sup>2</sup> (3 x 2.5 VQFN)	24.8 mm <sup>2</sup> (4. x 6.2 TSSOP)

← *Eliminates the need for a level translator*

← *Enables faster system sampling*

← *Protects I/O signal paths from system power rails*

← *Smallest 4-chn QFN package in the industry!*

**Mid Voltage 24V > V<sub>SIGNAL</sub> > 100V**  
**Multiplexers & Signal Switches**

# Selection Guide | Mid Voltage (24V > V<sub>SIGNAL</sub> > 100V)

Configuration	16:1	MUX36S16 MUX506		
	8:1	MUX36S08 MUX508 MPC508	MUX36D08 MUX507 MPC507	
	4:1	TMUX6104	MUX36D04 MUX509 MPC509	
	2:1	TMUX6136	TMUX6119	
	1:1		TMUX6121/22/23	TMUX6111/12/13
		1	2	4
Number of Channels				

- Precision
- Protection
- General Purpose

## TMUX Key Differences

	Precision	Protection	General Purpose
Ultra Low Leakage (pA)	✓	–	–
Powered-off Protection	–	✓	–
Overvoltage Protection (up to ±60V)	–	✓	–
Fail-safe Logic	✓	✓	✓
Smallest QFN packages	✓	✓	✓
TI Device Families:	TMUX61xx TMUX72xx	TMUX73xxF TMUX74xxF	MUX50x

## TMUXxxxxX Nomenclature

1 <sup>st</sup> Digit	2 <sup>nd</sup> Digit	3 <sup>rd</sup> & 4 <sup>th</sup> Digit	Final Letter
Supply Range	Product Family Generation	Channel Count & Configuration	Key Differentiation

\*indicates Roadmap device (release 2020)

# Mid Voltage | TMUX61xx Family

+16.5V single/ ±16.5V dual Supplies/Inputs | Low C<sub>ON</sub> | Low-Leakage-Multiplexer

## Features

- Dual supply operation: ±5V to ±16.5V
- Single supply operation: 10V to +16.5V
- **Low leakage current:** 10pA (typ.), 2nA (max.)
- **Low charge injection:** ±0.5pC (typ.)
- Low R<sub>ON</sub>: 125Ω (typ.)
- Low C<sub>ON</sub>: 4pF (typ.)
- Fast transition time: 80ns (typ.)
- Low supply current: 17 μA (typ.)
- Fail-safe logic
- Break-Before-Make switching action
- EN Pin Connectable to V<sub>DD</sub> with integrated pull-down
- TTL compatible Logic Levels: 2V to V<sub>DD</sub>
- ±2kV HBM ESD Protection
- Standard TSSOP package with small QFN package available

## Applications

- Factory Automation: PLC Analog Input Modules
- Test & Measurement: Silicon, memory, battery tester
- Audio supporting negative swing and PC Notebook/Tablets
- Metro Datacenter Interconnect

## Benefits

- Wide supplies range supporting rail-to-rail operation.
- Ultra-low leakage & charge injection: Improves accuracy
- Low C<sub>ON</sub> and fast t<sub>TRAN</sub>: Allow fast multi-channel sampling
- Small QFN package: Enables PCB space-limited designs

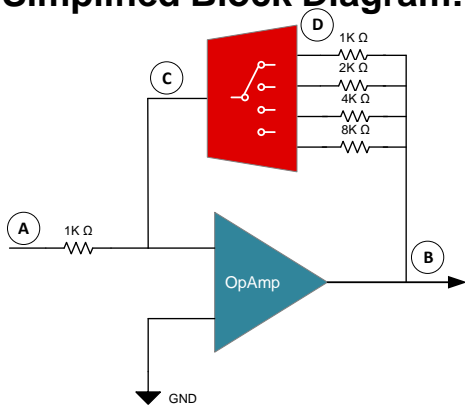
Device	V <sub>DD</sub>	Config.	#Ch.	RTM	Closest Competitor	
MUX36S16	±5V to ±18V (Dual Supply)	16:1	1	<a href="#">Released</a>	ADG1206	
MUX36S08		8:1	1	<a href="#">Released</a>	ADG1208	
MUX36D08	+10V to +36V (Single Supply)	8:1	2	<a href="#">Released</a>	ADG1207	
MUX36D04		4:1	2	<a href="#">Released</a>	ADG1209	
TMUX6104	±5V to ±16.5V (Dual Supply)	4:1	1	<a href="#">Released</a>	ADG1204	
TMUX6119		2:1	1	<a href="#">Released</a>	ADG1219	
TMUX6136		2:1	2	<a href="#">Released</a>	ADG1236	
TMUX6121		10V to +16.5V (Single Supply)	1:1	2	<a href="#">Released</a>	ADG1221
TMUX6122						ADG1222
TMUX6123						ADG1223
TMUX6111	1:1	4	<a href="#">Released</a>	ADG1211		
TMUX6112				ADG1212		
TMUX6113				ADG1213		



# Programmable Gain Selection

**Problem Statement:** Need to select different gain or attenuation ratio according to input signal profile.

## Simplified Block Diagram:



## Key Specs

- Low On Resistance (enables lower distortion & better linearity)
- **On Leakage Current** (Impacts the system accuracy)
- Low On Capacitance (enables faster settling and system sampling)
- Low Charge Injection (enables faster acquisition time)

Existing Devices	Signal Voltage Range (V)	Config	Channel	BW (MHz)	Ron (Ω)	Ich (mA)
<a href="#">TS5A3159</a>	0~5.5	2:1	1	100	0.75	200
<a href="#">TS5A3357</a>	0~5.5	3:1	1	334	5	100
<a href="#">TS12A12511</a>	0~12 or ±6	2:1	1	152	5	50
<a href="#">TMUX6104</a>	0~36 or ±18	4:1	1	500	125	25

New Devices	Signal Voltage Range (V)	Config	Channel	Ron (Ω)	Leakage current (I <sub>S</sub> )	On Capacitance (C <sub>ON</sub> )	Charge Injection (Q <sub>C</sub> )	Bandwidth (MHz)
<a href="#">TMUX1111</a>	0~5.5 V	1:1	4	2	5 pA (typ)	18 pF	1.5 pC (typ)	300
<a href="#">TMUX1104</a>	0~5.5 V	4:1	1	2	3 pA (typ)	35 pF	1.5 pC (typ)	155
<a href="#">TMUX6112</a>	0~16.5 or 16.5V	1:1	4	120	0.5pA (typ)	4.2 pF	0.6 pC (typ)	800

# Mid Voltage | MUX50x Family

MUX50x 36-V, Low-Capacitance, Low-Leakage-Current, Precision Analog Multiplexers

## Features

Low On-Capacitance

– MUX506: 13.5 pF

– MUX507: 8.7 pF

• **Ultra Low Input Leakage: 1 pA**

• **Low Charge Injection: 0.31 pC**

• Rail-to-Rail Operation

• Wide Supply Range:  $\pm 5$  V to  $\pm 18$  V, 10 V to 36 V

• Low On-Resistance: 125  $\Omega$

• Transition Time: 97 ns

• Break-Before-Make Switching Action

• EN Pin Connectable to VDD

• Logic Levels: 2 V to VDD

• Low Supply Current: 45  $\mu$ A

• ESD Protection HBM: 2000 V

• Industry-Standard TSSOP/ SOIC Package

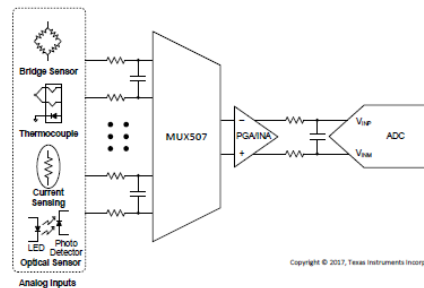
## Applications

- Factory Automation: PLC Analog Input Modules
- Test & Measurement: Silicon, memory, battery tester
- Digital Multimeters
- Battery Monitoring System

## Benefits

- Wide supplies range supporting rail-to-rail operation.
- Ultra-low leakage & charge injection: Improves accuracy
- Low  $C_{ON}$  and fast  $t_{TRAN}$ : Allow fast multi-channel sampling
- Industry Standard Package. TSSOP & SOIC

Simplified Schematic



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Device	$V_{DD}$	Config.	#Ch.	RTM	Closest Competitor
MUX506	$\pm 5$ V to $\pm 18$ V (Dual Supply)	16:1 x 1	1	<a href="#">Released</a>	ADG506/MAX306
MUX507		8:1 x 2	2	<a href="#">Released</a>	ADG507/MAX307
MUX508	+10V to +36V (Single Supply)	8:1 x 1	2	<a href="#">Released</a>	ADG508/MAX308
MUX509		4:1 x 2	2	<a href="#">Released</a>	ADG509/MAX309

# MSS Resources

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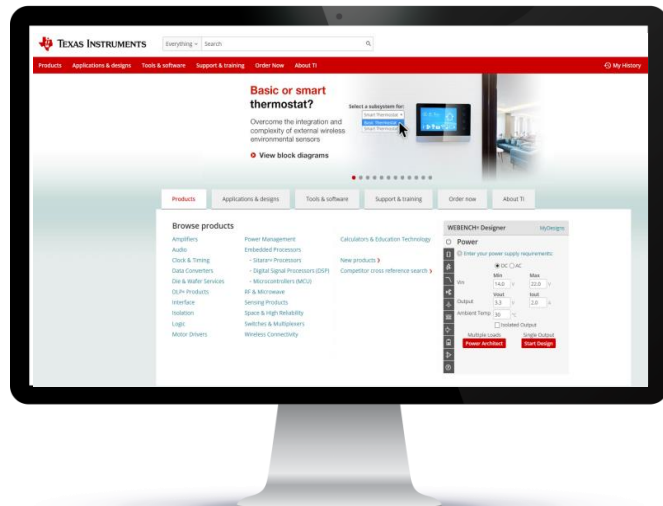
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