TMUX550x 40V, 130Ω, 8:1,1-Channel, 4:1, 2-Channel Switches with 1.8V Logic

1 Features

- Low On-Capacitance
  - TMUX5508: 15.5pF
  - TMUX5509: 10.2pF
- Low I_{ON} typical Leakage: 5pA
- Low Charge Injection: 9pC
- Rail-to-Rail Operation
- Wide Supply Range: ±5V to ±18V, 12V to 40V
- Low On-Resistance: 130Ω
- Break-Before-Make Switching
- Logic Levels: 1.8V
- ESD Protection HBM: 2000V
- Industry-Standard QFN, TSSOP and SOIC Packages

2 Applications

- Sample-and-hold circuits
- Feedback gain switching
- Semiconductor test equipment
- Professional Audio Equipment
- Factory Automation and Industrial Process Controls
- Programmable Logic Controllers (PLC)
- Analog Input Modules
- Digital Multimeters
- Data acquisition systems (DAQ)
- Instrumentation: lab, analytical, and portable
- Optical test equipment

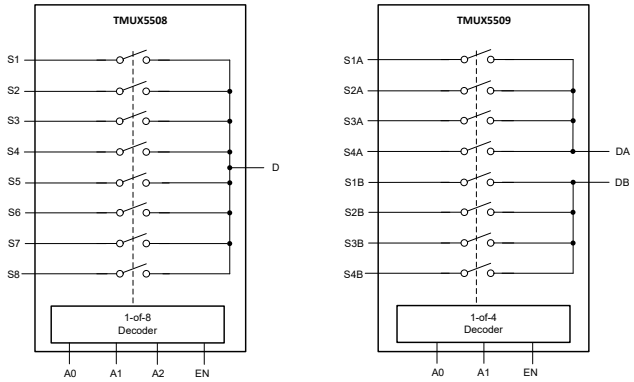
3 Description

The TMUX5508 and TMUX5509 (TMUX550x) are modern, complementary metal-oxide semiconductor (CMOS), analog multiplexers (muxes). The TMUX5508 offers 8:1 single-ended channels, and the TMUX5509 offers differential 4:1 or dual 4:1 single-ended channels. The TMUX5508 and TMUX5509 are designed to work with either dual supplies (±5V to ±18V) or a single supply (10V to 36V). They also perform with symmetric supplies (such as V_{DD} = 12V, V_{SS} = –12V), and unsymmetric supplies (such as V_{DD} = 12V, V_{SS} = –5V). The TMUX550x supports bidirectional analog and digital signals on the source (Sx) and drain (Dx) pins ranging from VSS to VDD.

Package Information

PART NUMBER	PACKAGE(1)	BODY SIZE (NOM)
TMUX550x	RSV - QFN (16)	2.6mm × 1.8mm
	PW - TSSOP (16)	5.00mm × 4.40mm
	D - SOIC (16)	9.90mm × 3.91mm

(1) For all available packages, see *Section 10*.



TMUX550x Block Diagram

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4 Device Comparison Table

PRODUCT	DESCRIPTION
TMUX5508	8-channel, single-ended analog multiplexer (8:1 mux)
TMUX5509	4-channel differential or dual 4:1 single-ended analog multiplexer (8:2 mux)

5 Pin Configuration and Functions

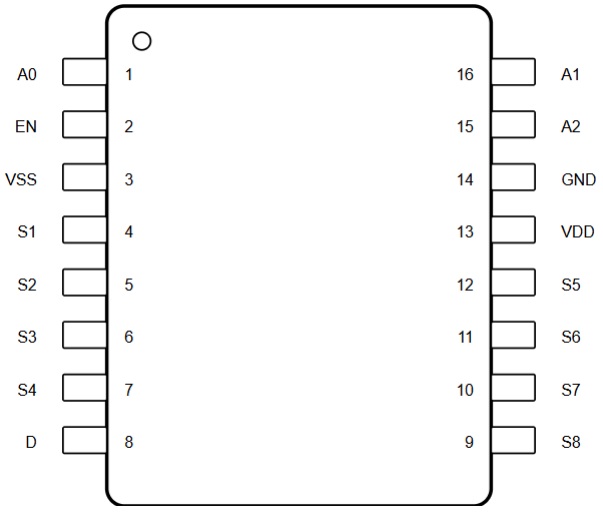

Figure 5-1. TMUX5508 PW-TSSOP and D-SOIC Pin Diagram

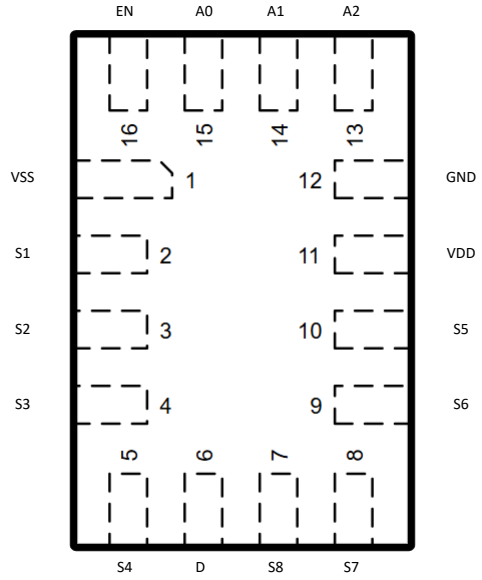

Figure 5-2. TMUX5508 RSV-QFN Pin Diagram

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Table 5-1. Pin Functions: TMUX5508

PIN			TYPE	DESCRIPTION
NAME	RSV NO.	PW/SOIC NO.		
A0	15	1	Digital input	Address line 0
A1	14	16	Digital input	Address line 1
A2	13	15	Digital input	Address line 2
D	6	8	Analog input or output	Drain pin. Can be an input or output.
EN	16	2	Digital input	Active high digital input. When this pin is low, all switches are turned off. When this pin is high, the A[2:0] logic inputs determine which switch is turned on.
GND	12	14	Power supply	Ground (0V) reference
S1	2	4	Analog input or output	Source pin 1. Can be an input or output.
S2	3	5	Analog input or output	Source pin 2. Can be an input or output.
S3	4	6	Analog input or output	Source pin 3. Can be an input or output.
S4	5	7	Analog input or output	Source pin 4. Can be an input or output.
S5		12	Analog input or output	Source pin 5. Can be an input or output.
S6	9	11	Analog input or output	Source pin 6. Can be an input or output.
S7	8	10	Analog input or output	Source pin 7. Can be an input or output.
S8	7	9	Analog input or output	Source pin 8. Can be an input or output.
VDD	11	13	Power supply	Positive power supply. This pin is the most positive power-supply potential. For reliable operation, connect a decoupling capacitor ranging from 0.1µF to 10µF between VDD and GND.
VSS	1	3	Power supply	Negative power supply. This pin is the most negative power-supply potential. In single-supply applications, this pin can be connected to ground. For reliable operation, connect a decoupling capacitor ranging from 0.1µF to 10µF between VSS and GND.

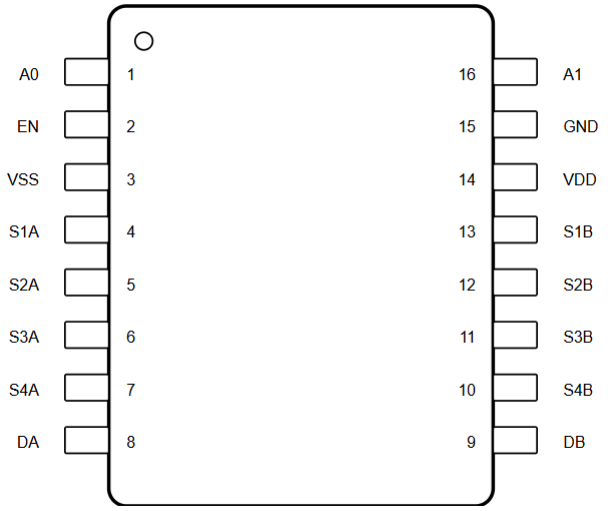

Figure 5-3. TMUX5509 PW-TSSOP and D-SOIC Pin Digram

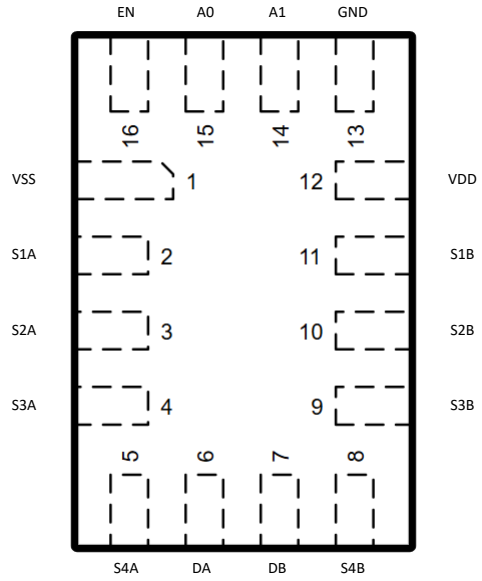

Figure 5-4. TMUX5509 RSV-QFN Pin Digram

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Table 5-2. Pin Functions: TMUX5509

PIN			TYPE	DESCRIPTION
NAME	RSV NO.	PW/SOIC NO.		
A0	15	1	Digital input	Address line 0
A1	14	16	Digital input	Address line 1
DA	6	8	Analog input or output	Drain pin A. Can be an input or output.
DB	7	9	Analog input or output	Drain pin B. Can be an input or output.
EN	16	2	Digital input	Active high digital input. When this pin is low, all switches are turned off. When this pin is high, the A[1:0] logic inputs determine which pair of switches is turned on.
GND	13	15	Power supply	Ground (0V) reference
S1A	2	4	Analog input or output	Source pin 1A. Can be an input or output.
S2A	3	5	Analog input or output	Source pin 2A. Can be an input or output.
S3A	4	6	Analog input or output	Source pin 3A. Can be an input or output.
S4A	5	7	Analog input or output	Source pin 4A. Can be an input or output.
S1B	11	13	Analog input or output	Source pin 1B. Can be an input or output.
S2B	10	12	Analog input or output	Source pin 2B. Can be an input or output.
S3B	9	11	Analog input or output	Source pin 3B. Can be an input or output.
S4B	8	10	Analog input or output	Source pin 4B. Can be an input or output.
VDD	12	14	Power supply	Positive power supply. This pin is the most positive power supply potential. For reliable operation, connect a decoupling capacitor ranging from 0.1µF to 10µF between VDD and GND.
VSS	1	3	Power supply	Negative power supply. This pin is the most negative power supply potential. In single-supply applications, this pin can be connected to ground. For reliable operation, connect a decoupling capacitor ranging from 0.1µF to 10µF between VSS and GND.

6 Specifications

6.1 Absolute Maximum Ratings

over operating free-air temperature range (unless otherwise noted)(1) (2)

		MIN	MAX	UNIT
$V_{DD} - V_{SS}$	Supply voltage		44	V
V_{DD}		–0.5	44	V
V_{SS}		–44	0.5	V
V_{SEL}- V_{SS}	Logic Supply Voltage	–0.5	44	V
I_{SEL}	Logic control input pin current (SEL pins)	–30	30	mA
V_S or V_D	Source or drain voltage (Sx, Dx)	V_{SS}–0.5	V_{DD}+0.5	V
I_{IK}	Diode clamp current(3)	–30	30	mA
I_S or $I_{D\ (CONT)}$	Source or drain current (Sx, Dx)	-20	20	mA
I_{peak}	Source or drain pulse current (Sx, Dx: pulsed at 1ms, 10% duty cycle max)	-45	45	mA
T_A	Ambient temperature	–55	150	°C
T_{stg}	Storage temperature	–65	150	°C
T_J	Junction temperature		150	°C

(1) Operation outside the Absolute Maximum Ratings may cause permanent device damage. Absolute Maximum Ratings do not imply functional operation of the device at these or any other conditions beyond those listed under Recommended Operating Conditions. If used outside the Recommended Operating Conditions but within the Absolute Maximum Ratings, the device may not be fully functional, and this may affect device reliability,
functionality, performance, and shorten the device lifetime.
(2) All voltages are with respect to ground, unless otherwise specified.
(3) Pins are diode-clamped to the power-supply rails. Over voltage signals must be voltage and current limited to maximum ratings.

6.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/ JEDEC JS-001, all pins(1)	±2000	V
		Charged device model (CDM), per ANSI/ESDA/ JEDEC JS-002, all pins(2)	±500	

(1) JEDEC document JEP155 states that 500V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250V CDM allows safe manufacturing with a standard ESD control process.

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6.3 Recommended Operating Conditions

over operating free-air temperature range (unless otherwise noted)

			MIN	NOM	MAX	UNIT
V_{DD} – V_{SS} (1)	Power supply voltage differential		4.5		40	V
V_{DD}	Positive power supply voltage		4.5		40	V
V_{SS}	Negative power supply voltage (dual)		-40		0	V
V_S or V_D	Signal path input/output voltage (source or drain pin) (Sx, D)		V_{SS}		V_{DD}	V
V_{SEL}- V_{SS}	Logic Supply Voltage	Logic supply voltage	0		40	V
I_S or $I_{D\ (CONT)}$	Source or drain continuous current (Sx, D)		-15		15	mA
V_{IH}	Logic Input High	Logic Inputs (Ax / EN pins)	1.3		40	
V_{IL}	Logic Input Low	Logic Inputs (Ax / EN pins)	0		0.8	
T_A	Ambient temperature		–40		125	°C

(1) V_{DD} and V_{SS} can be any value as long as 4.5V ≤ (V_{DD} – V_{SS}) ≤ 50 V, and the minimum V_{DD} is met.

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6.4 Electrical Characteristics (±15V Dual Supply)

V_{DD} = +15V ± 10%, V_{SS} = –15V ±10% GND = 0V (unless otherwise noted)
Typical at V_{DD} = +15V, V_{SS} = –15V, T_A = 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
ANALOG SWITCH							
R_{ON}	On-resistance	V_S = V_{SS} +5V to V_{DD} -5V I_D = –1mA	25°C		130	150	Ω
			–40°C to +85°C			185	
			–40°C to +125°C			220	
ΔR_{ON}	On-resistance mismatch between channels	V_S = V_{SS} +5V to V_{DD} -5V I_D = –1mA	25°C		1.3	2	Ω
			–40°C to +85°C			2.5	
			–40°C to +125°C			3	
$R_{ON\ FLAT}$	On-resistance flatness	V_S = V_{SS} +5V to V_{DD} -5V I_D = –1mA	25°C		0.01	0.4	Ω
			–40°C to +85°C			0.9	
			–40°C to +125°C			1	
$I_{S(OFF)}$	TMUX5508 Source off leakage current(1)	V_{DD} = 16.5V, V_{SS} = –16.5V Switch state is off V_S = +10V / –10V V_D = –10V / + 10V	25°C		0.005		nA
			–40°C to +85°C	–100		100	
			–40°C to +125°C	–100		100	
$I_{S(OFF)}$	TMUX5509 Source off leakage current(1)	V_{DD} = 16.5V, V_{SS} = –16.5V Switch state is off V_S = +10V / –10V V_D = –10V / + 10V	25°C		0.005		nA
			–40°C to +85°C	–50		50	
			–40°C to +125°C	–50		50	
$I_{D(OFF)}$	TMUX5508 Drain off leakage current(1)	V_{DD} = 16.5V, V_{SS} = –16.5V Switch state is off V_S = +10V / –10V V_D = –10V / + 10V	25°C		0.005		nA
			–40°C to +85°C	–100		100	
			–40°C to +125°C	–100		100	
$I_{D(OFF)}$	TMUX5509 Drain off leakage current(1)	V_{DD} = 16.5V, V_{SS} = –16.5V Switch state is off V_S = +10V / –10V V_D = –10V / + 10V	25°C		0.005		nA
			–40°C to +85°C	–50		50	
			–40°C to +125°C	–50		50	
$I_{S(ON)}$ $I_{D(ON)}$	TMUX5508 Channel on leakage current(2)	V_{DD} = 16.5V, V_{SS} = –16.5V Switch state is on V_S = V_D = ±10V	25°C		0.005		nA
			–40°C to +85°C	–100		100	
			–40°C to +125°C	–100		100	
$I_{S(ON)}$ $I_{D(ON)}$	TMUX5509 Channel on leakage current(2)	V_{DD} = 16.5V, V_{SS} = –16.5V Switch state is on V_S = V_D = ±10V	25°C		0.005		nA
			–40°C to +85°C	–50		50	
			–40°C to +125°C	–50		50	
POWER SUPPLY							
I_{DDQ}	V_{DD} quiescent supply current	V_{DD} = 16.5V, V_{SS} = –16.5V All switches OFF	25°C		35	60	µA
			–40°C to +85°C			65	
			–40°C to +125°C			70	
I_{DD}	V_{DD} supply current	V_{DD} = 16.5V, V_{SS} = –16.5V All switches ON	25°C		55	75	µA
			–40°C to +85°C			80	
			–40°C to +125°C			85	
I_{SSQ}	V_{SS} quiescent supply current	V_{DD} = 16.5V, V_{SS} = –16.5V All switches OFF	25°C		15	30	µA
			–40°C to +85°C			35	
			–40°C to +125°C			40	
I_{SS}	V_{SS} supply current	V_{DD} = 16.5V, V_{SS} = –16.5V All switches ON	25°C		20	40	µA
			–40°C to +85°C			45	
			–40°C to +125°C			50	

(1) When V_S is positive, V_D is negative, or when V_S is negative, V_D is positive.

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(2) When V_S is at a voltage potential, V_D is floating, or when V_D is at a voltage potential, V_S is floating.

6.5 Switching Characteristics (±15V Dual Supply)

V_{DD} = +15V ± 10%, V_{SS} = –15V ±10%, GND = 0V (unless otherwise noted)
Typical at V_{DD} = +15V, V_{SS} = –15V, T_A = 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
t_{tran}	Transition Time	VSx = +10V/-10V, VSx+1 = -10V/+10V, R_L = 1MΩ, C_L= 35pF	25°C		190	220	ns
			–40°C to +85°C			250	ns
			–40°C to +125°C			260	ns
t_{ON}	Turn-on time from control input	V_S = 5V R_L = 1kΩ, C_L = 35pF	25°C		250	270	ns
			–40°C to +85°C			295	ns
			–40°C to +125°C			310	ns
t_{OFF}	Turn-off time from control input	V_S = 5V R_L = 1kΩ, C_L = 35pF	25°C		125	155	ns
			–40°C to +85°C			160	ns
			–40°C to +125°C			165	ns
t_{BBM}	Break-before-make time delay	V_{Sx} = 5V, R_L = 1kΩ, C_L = 35pF	25°C		140		ns
			–40°C to +85°C	100			ns
			–40°C to +125°C	100			ns
Q_{INJ}	Charge injection	V_S = 0V, C_L = 100pF	25°C		9		pC
O_{ISO}	Off-isolation	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, V_{BIAS} = 0V, f = 100kHz	25°C		–105		dB
O_{ISO}	Off-isolation	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, V_{BIAS} = 0V, f = 1MHz	25°C		–85		dB
X_{TALK}	Crosstalk	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, V_{BIAS} = 0V, f = 100kHz	25°C		–114		dB
X_{TALK}	Crosstalk	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, V_{BIAS} = 0V, f = 1MHz	25°C		–105		dB
BW	–3dB Bandwidth	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, V_{BIAS} = 0V	25°C		250		MHz
I_L	Insertion loss	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, V_{BIAS} = 0V, f = 1MHz	25°C		-7.1		dB
ACPSRR	AC Power Supply Rejection Ratio	V_{PP} = 0.62V on V_{DD} and V_{SS} R_L = 50Ω , C_L = 5pF, f = 1MHz	25°C		–50		dB
$C_{S(OFF)}$	TMUX5508 Source off capacitance to ground	V_S = 0V, f = 1MHz	25°C		2.1		pF
	TMUX5509 Source off capacitance to ground				2.1		
$C_{D(OFF)}$	TMUX5508 Drain off capacitance to ground	V_S = 0V, f = 1MHz	25°C		11.2		
	TMUX5509 Drain off capacitance to ground				6.1		
$C_{S(ON)}$, $C_{D(ON)}$	TMUX5508 On capacitance to ground	V_S = 0V, f = 1MHz	25°C		15.5		
	TMUX5509 On capacitance to ground				10.2		

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6.6 Electrical Characteristics (±20V Dual Supply)

V_{DD} = +20V, V_{SS} = –20V, GND = 0V (unless otherwise noted)
Typical at V_{DD} = +20V, V_{SS} = –20V, T_A = 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
ANALOG SWITCH							
R_{ON}	On-resistance	V_S = V_{SS} +5V to V_{DD} -5V I_D = –1mA	25°C		130	150	Ω
			–40°C to +85°C			185	
			–40°C to +125°C			220	
ΔR_{ON}	On-resistance mismatch between channels	V_S = V_{SS} +5V to V_{DD} -5V I_D = –1mA	25°C		1.4	4	Ω
			–40°C to +85°C			5	
			–40°C to +125°C			6	
$R_{ON\ FLAT}$	On-resistance flatness	V_S = V_{SS} +5V to V_{DD} -5V I_D = –1mA	25°C		0.01	0.4	Ω
			–40°C to +85°C			0.8	
			–40°C to +125°C			1	
$I_{S(OFF)}$	TMUX5508 Source off leakage current(1)	V_{DD} = 22V, V_{SS} = –22V Switch state is off V_S = +15V / –15V V_D = –15V / + 15V	25°C		0.002		nA
			–40°C to +85°C	–100		100	
			–40°C to +125°C	–100		100	
$I_{S(OFF)}$	TMUX5509 Source off leakage current(1)	V_{DD} = 22V, V_{SS} = –22V Switch state is off V_S = +15V / –15V V_D = –15V / + 15V	25°C		0.005		nA
			–40°C to +85°C	–50		50	
			–40°C to +125°C	–50		50	
$I_{D(OFF)}$	TMUX5508 Drain off leakage current(1)	V_{DD} = 22V, V_{SS} = –22V Switch state is off V_S = +15V / –15V V_D = –15V / + 15V	25°C		0.01		nA
			–40°C to +85°C	–100		100	
			–40°C to +125°C	–100		100	
$I_{D(OFF)}$	TMUX5509 Drain off leakage current(1)	V_{DD} = 22V, V_{SS} = –22V Switch state is off V_S = +15V / –15V V_D = –15V / + 15V	25°C		0.02		nA
			–40°C to +85°C	–50		50	
			–40°C to +125°C	–50		50	
$I_{S(ON)}$ $I_{D(ON)}$	TMUX5508 Channel on leakage current(2)	V_{DD} = 22V, V_{SS} = –22V Switch state is on V_S = V_D = ±15V	25°C		0.01		nA
			–40°C to +85°C	–100		100	
			–40°C to +125°C	–100		100	
$I_{S(ON)}$ $I_{D(ON)}$	TMUX5509 Channel on leakage current(2)	V_{DD} = 22V, V_{SS} = –22V Switch state is on V_S = V_D = ±15V	25°C		0.01		nA
			–40°C to +85°C	–50		50	
			–40°C to +125°C	–50		50	
POWER SUPPLY							
I_{DDQ}	V_{DD} quiescent supply current	V_{DD} = 22V, V_{SS} = –22V All switches OFF	25°C		50	65	µA
			–40°C to +85°C			70	
			–40°C to +125°C			75	
I_{DD}	V_{DD} supply current	V_{DD} = 22V, V_{SS} = –22V All switches ON	25°C		60	80	µA
			–40°C to +85°C			85	
			–40°C to +125°C			90	
I_{SSQ}	V_{SS} quiescent supply current	V_{DD} = 22V, V_{SS} = –22V All switches OFF	25°C		25	35	µA
			–40°C to +85°C			40	
			–40°C to +125°C			45	
I_{SS}	V_{SS} supply current	V_{DD} = 22V, V_{SS} = –22V All switches ON	25°C		30	40	µA
			–40°C to +85°C			45	
			–40°C to +125°C			50	

(1) When V_S is positive, V_D is negative, or when V_S is negative, V_D is positive.

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(2) When V_S is at a voltage potential, V_D is floating, or when V_D is at a voltage potential, V_S is floating.

6.7 Switching Characteristics (±20V Dual Supply)

V_{DD} = +20V, V_{SS} = –20V, GND = 0V (unless otherwise noted)
Typical at V_{DD} = +20V, V_{SS} = –20V, T_A = 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
t_{tran}	Transition Time	VSx = +20V/-20V, VSx+1 = -20V/+20V, R_L = 1MΩ, C_L= 35pF	25°C		235	260	ns
			–40°C to +85°C			280	
			–40°C to +125°C			290	
t_{ON}	Turn-on time from control input	V_S = 10V R_L = 300Ω, C_L = 35pF	25°C		285	320	ns
			–40°C to +85°C			350	ns
			–40°C to +125°C			380	ns
t_{OFF}	Turn-off time from control input	V_S = 10V R_L = 300Ω, C_L = 35pF	25°C		135	170	ns
			–40°C to +85°C			180	ns
			–40°C to +125°C			190	µs
t_{BBM}	Break-before-make time delay	V_S = 10V, R_L = 300Ω, C_L = 35pF	25°C		185		ns
			–40°C to +85°C	130			ns
			–40°C to +125°C	130			ns
Q_{INJ}	Charge injection	V_S = 0V, C_L = 100pF	25°C		-11		pC
O_{ISO}	Off-isolation	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, V_{BIAS} = 0V, f = 100kHz	25°C		–105		dB
O_{ISO}	Off-isolation	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, V_{BIAS} = 0V, f = 1MHz	25°C		–76		dB
X_{TALK}	Crosstalk	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, V_{BIAS} = 0V, f = 100kHz	25°C		–114		dB
X_{TALK}	Crosstalk	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, V_{BIAS} = 0V, f = 1MHz	25°C		–105		dB
BW	–3dB Bandwidth	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, V_{BIAS} = 0V,	25°C		200		MHz
I_L	Insertion loss	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, V_{BIAS} = 0V, f = 1MHz	25°C		–7.1		dB
ACPSRR	AC Power Supply Rejection Ratio	V_{PP} = 0.62V on V_{DD} and V_{SS} R_L = 50Ω , C_L = 5pF, f = 1MHz	25°C		–50		dB
$C_{S(OFF)}$	TMUX5508 Source off capacitance to ground	V_S = 0V, f = 1MHz	25°C		2.1		pF
	TMUX5509 Source off capacitance to ground				2.1		
$C_{D(OFF)}$	TMUX5508 Drain off capacitance to ground	V_S = 0V, f = 1MHz	25°C		10.8		pF
	TMUX5509 Drain off capacitance to ground				5.8		
$C_{S(ON)}$, $C_{D(ON)}$	TMUX5508 On capacitance to ground	V_S = 0V, f = 1MHz	25°C		14.9		pF
	TMUX5509 On capacitance to ground				9.9		

ADVANCE INFORMATION

6.8 Electrical Characteristics (12V Single Supply)

V_{DD} = +12V ± 10%, V_{SS} = 0V, GND = 0V (unless otherwise noted)
Typical at V_{DD} = +12V, V_{SS} = 0V, T_A = 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
ANALOG SWITCH							
R_{ON}	On-resistance	V_S = V_{SS} +3V to V_{DD} -3V I_D = –1mA	25°C		140	175	Ω
			–40°C to +85°C			215	
			–40°C to +125°C			250	
ΔR_{ON}	On-resistance mismatch between channels	V_S = V_{SS} +3V to V_{DD} -3V I_D = –1mA	25°C		1.3	2.5	Ω
			–40°C to +85°C			3	
			–40°C to +125°C			3.5	
$R_{ON\ FLAT}$	On-resistance flatness	V_S = V_{SS} +3V to V_{DD} -3V I_D = –1mA	25°C		8	30	Ω
			–40°C to +85°C			35	
			–40°C to +125°C			40	
$I_{S(OFF)}$	TMUX5508 Source off leakage current(1)	V_{DD} = 12V, V_{SS} = 0V Switch state is off V_S = 1V / 10V V_D = 10V / 1V	25°C		0.003		nA
			–40°C to +85°C	–100		100	
			–40°C to +125°C	–100		100	
$I_{S(OFF)}$	TMUX5509 Source off leakage current(1)	V_{DD} = 12V, V_{SS} = 0V Switch state is off V_S = 1V / 10V V_D = 10V / 1V	25°C		0.004		nA
			–40°C to +85°C	–50		50	
			–40°C to +125°C	–50		50	
$I_{D(OFF)}$	TMUX5508 Drain off leakage current(1)	V_{DD} = 12V, V_{SS} = 0V Switch state is off V_S = 1V / 10V V_D = 10V / 1V	25°C		0.002		nA
			–40°C to +85°C	–100		100	
			–40°C to +125°C	–100		100	
$I_{D(OFF)}$	TMUX5509 Drain off leakage current(1)	V_{DD} = 12V, V_{SS} = 0V Switch state is off V_S = 1V / 10V V_D = 10V / 1V	25°C		0.003		nA
			–40°C to +85°C	–50		50	
			–40°C to +125°C	–50		50	
$I_{S(ON)}$ $I_{D(ON)}$	TMUX5508 Channel on leakage current(2)	V_{DD} = 12V, V_{SS} = 0V Switch state is on V_S = V_D = 1V or 10V	25°C		0.003		nA
			–40°C to +85°C	–100		100	
			–40°C to +125°C	–100		100	
$I_{S(ON)}$ $I_{D(ON)}$	TMUX5509 Channel on leakage current(2)	V_{DD} = 12V, V_{SS} = 0V Switch state is on V_S = V_D = 1V or 10V	25°C		0.002		nA
			–40°C to +85°C	–50		50	
			–40°C to +125°C	–50		50	
POWER SUPPLY							
I_{DDQ}	V_{DD} quiescent supply current	V_{DD} = 12V, V_{SS} = 0V All switches OFF	25°C		45	55	µA
			–40°C to +85°C			60	
			–40°C to +125°C			65	
I_{DD}	V_{DD} supply current	V_{DD} = 12V, V_{SS} = 0V All switches ON	25°C		50	65	µA
			–40°C to +85°C			70	
			–40°C to +125°C			75	

(1) When V_S is positive, V_D is negative, or when V_S is negative, V_D is positive.
(2) When V_S is at a voltage potential, V_D is floating, or when V_D is at a voltage potential, V_S is floating.

ADVANCE INFORMATION

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6.9 Switching Characteristics (12V Single Supply)

V_{DD} = +12V ± 10%, V_{SS} = 0V, GND = 0V (unless otherwise noted)
Typical at V_{DD} = +12V, V_{SS} = 0V, T_A = 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
t_{tran}	Transition Time	VSx = +10V/0V, VSx+1 = 0V/+10V, R_L = 1MΩ, C_L= 35pF	25°C		140	190	ns
			–40°C to +85°C			210	
			–40°C to +125°C			220	
t_{ON}	Turn-on time from control input	V_S = 5V R_L = 1kΩ, C_L = 35pF	25°C		135	180	ns
			–40°C to +85°C			200	
			–40°C to +125°C			210	
t_{OFF}	Turn-off time from control input	V_S = 5V R_L = 1kΩ, C_L = 35pF	25°C		135	170	ns
			–40°C to +85°C			180	
			–40°C to +125°C			190	
t_{BBM}	Break-before-make time delay	V_{Sx} = 5V, R_L = 1kΩ, C_L = 35pF	25°C		115		ns
			–40°C to +85°C	70			
			–40°C to +125°C	70			
Q_{INJ}	Charge injection	V_S = 6V, C_L = 100pF	25°C		6.8		pC
O_{ISO}	Off-isolation	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, VBIAS = 6V, f = 100kHz	25°C		–100		dB
O_{ISO}	Off-isolation	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, VBIAS = 6V, f = 1MHz	25°C		–70		dB
X_{TALK}	Crosstalk	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, VBIAS = 6V, f = 100kHz	25°C		–114		dB
X_{TALK}	Crosstalk	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, VBIAS = 6V, f = 1MHz	25°C		–105		dB
BW	–3dB Bandwidth	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, VBIAS = 6V	25°C		165		MHz
I_L	Insertion loss	R_L = 50Ω , C_L = 5pF V_S = 200mV_{RMS}, VBIAS = 6V, f = 1MHz	25°C		–0.095		dB
ACPSRR	AC Power Supply Rejection Ratio	V_{PP} = 0.62V on V_{DD} and V_{SS} R_L = 50Ω , C_L = 5pF, f = 1MHz	25°C		–50		dB
$C_{S(OFF)}$	TMUX5508 Source off capacitance to ground	V_S = 0V, f = 1MHz	25°C		2.4		pF
	TMUX5509 Source off capacitance to ground				2.4		
$C_{D(OFF)}$	TMUX5508 Drain off capacitance to ground	V_S = 0V, f = 1MHz	25°C		13		pF
	TMUX5509 Drain off capacitance to ground				7		
$C_{S(ON)}$, $C_{D(ON)}$	TMUX5508 On capacitance to ground	V_S = 0V, f = 1MHz	25°C		18		pF
	TMUX5509 On capacitance to ground				11.5		

6.10 40V Single Supply: Electrical Characteristics

V_{DD} = +40V, V_{SS} = 0V, GND = 0V (unless otherwise noted)
Typical at V_{DD} = +40V, V_{SS} = 0V, T_A = 25°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
ANALOG SWITCH							
R_{ON}	On-resistance	V_S = V_{SS} + 5V to V_{DD} -5V I_D = –1mA	25°C		130	150	Ω
			–40°C to +85°C			190	Ω
			–40°C to +125°C			225	Ω
ΔR_{ON}	On-resistance mismatch between channels	V_S = V_{SS} + 5V to V_{DD} -5V I_D = –1mA	25°C		1.3		Ω
			–40°C to +85°C			2	Ω
			–40°C to +125°C			3	Ω
$R_{ON\ FLAT}$	On-resistance flatness	V_S = V_{SS} + 5V to V_{DD} -5V I_D = –1mA	25°C		0.1		Ω
			–40°C to +85°C			0.75	Ω
			–40°C to +125°C			1.5	Ω
$I_{S(OFF)}$	TMUX5508 Source off leakage current(1)	V_{DD} = 40V, V_{SS} = 0V Switch state is off V_S = 35V / 1V V_D = 1V / 35V	25°C		0.003		nA
			–40°C to +85°C	–100		100	nA
			–40°C to +125°C	–100		100	nA
$I_{S(OFF)}$	TMUX5509 Source off leakage current(1)	V_{DD} = 40V, V_{SS} = 0V Switch state is off V_S = 35V / 1V V_D = 1V / 35V	25°C		0.005		nA
			–40°C to +85°C	–50		50	nA
			–40°C to +125°C	–50		50	nA
$I_{D(OFF)}$	TMUX5508 Drain off leakage current(1)	V_{DD} = 40V, V_{SS} = 0V Switch state is off V_S = 35V / 1V V_D = 1V / 35V	25°C		0.01		nA
			–40°C to +85°C	–100		100	nA
			–40°C to +125°C	–100		100	nA
$I_{D(OFF)}$	TMUX5509 Drain off leakage current(1)	V_{DD} = 40V, V_{SS} = 0V Switch state is off V_S = 35V / 1V V_D = 1V / 35V	25°C		0.02		nA
			–40°C to +85°C	–50		50	nA
			–40°C to +125°C	–50		50	nA
$I_{S(ON)}$ $I_{D(ON)}$	TMUX5508 Channel on leakage current(2)	V_{DD} = 40V, V_{SS} = 0V Switch state is on V_S = V_D = 35V or 1V	25°C		0.01		nA
			–40°C to +85°C	–100		100	nA
			–40°C to +125°C	–100		100	nA
$I_{S(ON)}$ $I_{D(ON)}$	TMUX5509 Channel on leakage current(2)	V_{DD} = 40V, V_{SS} = 0V Switch state is on V_S = V_D = 35V or 1V	25°C		0.01		nA
			–40°C to +85°C	–50		50	nA
			–40°C to +125°C	–50		50	nA
LOGIC INPUTS (SEL / EN pins)							
POWER SUPPLY							
I_{DD}	V_{DD} supply current	V_{DD} = 40V, V_{SS} = 0V Logic inputs = 0V, 5V, or V_{DD}	25°C		60	85	µA
			–40°C to +85°C			90	µA
			–40°C to +125°C			95	µA
I_{DDQ}	V_{DD} quiescent supply current	V_{DD} = 40V, V_{SS} = 0V All Switches OFF	–40°C to +125°C			80	µA

(1) When V_S is positive, V_D is negative, or when V_S is negative, V_D is positive.
(2) When V_S is at a voltage potential, V_D is floating, or when V_D is at a voltage potential, V_S is floating.

ADVANCE INFORMATION

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6.11 40V Single Supply: Switching Characteristics

V_{DD} = +40V, V_{SS} = 0V, GND = 0V (unless otherwise noted)
Typical at V_{DD} = +40V, V_{SS} = 0V, T_A = 25°C (unless otherwise noted)

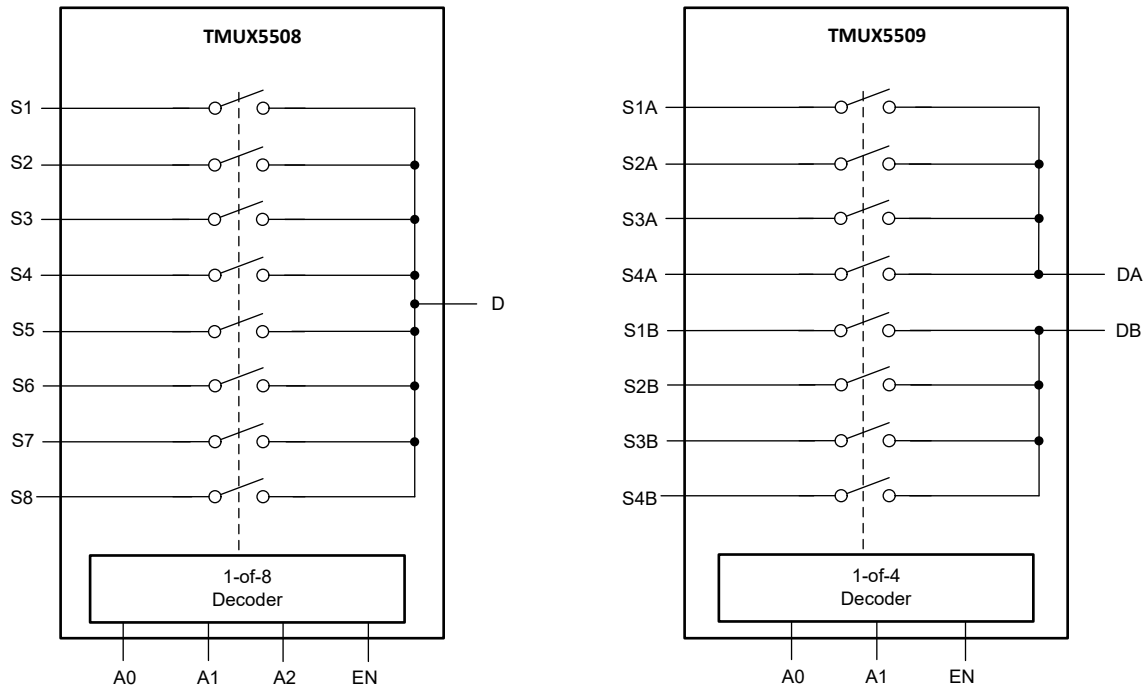
PARAMETER		TEST CONDITIONS	T_A	MIN	TYP	MAX	UNIT
t_{tran}	Transition Time	VSx = +10V/0V, VSx+1= 0V/+10V, R_L = 1MΩ, C_L= 35pF	25°C		185	260	ns
t_{tran}	Transition Time	VSx = +10V/0V, VSx+1 = 0V/+10V, R_L = 1MΩ, C_L= 35pF	–40°C to +85°C			280	ns
t_{tran}	Transition Time	VSx = +10V/0V, VSx+1 = 0V/+10V, R_L = 1MΩ, C_L= 35pF	–40°C to +125°C			290	ns
t_{ON}	Turn-on time from control input	V_S = 5V R_L = 1kΩ, C_L = 35pF	25°C		185	250	ns
			–40°C to +85°C			270	ns
			–40°C to +125°C			290	ns
t_{OFF}	Turn-off time from control input	V_S = 5V R_L = 1kΩ, C_L = 35pF	25°C		143	160	ns
			–40°C to +85°C			170	ns
			–40°C to +125°C			180	ns
t_{BBM}	Break-before-make time delay	V_{Sx} = 5V, R_L = 1kΩ, C_L = 35pF	25°C		160		ns
			–40°C to +85°C	90			ns
			–40°C to +125°C	90			ns
Q_{INJ}	Charge injection	V_S = 20V, C_L = 100pF	25°C		10.5		pC
O_{ISO}	Off-isolation	R_L = 50Ω , C_L = 5pF V_S = 6V, f = 100kHz	25°C		-100		dB
O_{ISO}	Off-isolation	R_L = 50Ω , C_L = 5pF V_S = 6V, f = 1MHz	25°C		-82		dB
X_{TALK}	Crosstalk	R_L = 50Ω , C_L = 5pF V_S = 6V, f = 100kHz	25°C		-110		dB
X_{TALK}	Crosstalk	R_L = 50Ω , C_L = 5pF V_S = 6V, f = 1MHz	25°C		-100		dB
BW	–3dB Bandwidth	R_L = 50Ω , C_L = 5pF V_S = 6V	25°C		400		MHz
I_L	Insertion loss	R_L = 50Ω , C_L = 5pF V_S = 6V, f = 1MHz	25°C		-6.3		dB
ACPSRR	AC Power Supply Rejection Ratio	V_{PP} = 0.62V on V_{DD} and V_{SS} R_L = 50Ω , C_L = 5pF, f = 1MHz	25°C		-50		dB
$C_{S(OFF)}$	TMUX5508 Source off capacitance to ground	V_S = 0V, f = 1MHz	25°C		2.1		pF
$C_{S(OFF)}$	TMUX5509 Source off capacitance to ground	V_S = 0V, f = 1MHz	25°C		2.1		pF
$C_{D(OFF)}$	TMUX5508 Drain off capacitance to ground	V_S = 0V, f = 1MHz	25°C		11		pF
$C_{D(OFF)}$	TMUX5509 Drain off capacitance to ground	V_S = 0V, f = 1MHz	25°C		6		pF
$C_{S(ON)}$, $C_{D(ON)}$	TMUX5508 On capacitance to ground	V_S = 0V, f = 1MHz	25°C		15		pF
$C_{S(ON)}$, $C_{D(ON)}$	TMUX5509 On capacitance to ground	V_S = 0V, f = 1MHz	25°C		10.5		pF

7 Detailed Description

7.1 Overview

The TMUX550x are a family of analog multiplexers. Section 7.2 provides a top-level block diagram of both the TMUX5508 and TMUX5509. The TMUX5508 is an eight-channel, single-ended, analog mux. The TMUX5509 is a four-channel, differential or dual 4:1, single-ended, analog mux. Each channel is turned on or turned off based on the state of the address lines and enable pin.

7.2 Functional Block Diagram



ADVANCE INFORMATION

7.3 Feature Description

7.3.1 Bidirectional Operation

The TMUX550x are operable as both a mux or demux. The source (Sx, SxA, SxB) and drain (D, DA, DB) pins of the TMUX550x are used either as input or output. Each TMUX550x channel has very similar characteristics in both directions.

7.3.2 Rail-to-Rail Operation

A valid analog signal for the TMUX550x ranges from V_{SS} to V_{DD}. The input signal to the TMUX550x can swing from V_{SS} to V_{DD} without any significant degradation in performance. The best R_{ON} performance for the signal will be 5V below V_{DD} and 5V above V_{SS}.

7.3.3 1.8 V Logic Compatible Inputs

The TMUX550x has 1.8V logic compatible control for all logic control inputs. 1.8V logic level inputs allows the TMUX550x to interface with processors that have lower logic I/O rails and eliminates the need for an external translator, which saves both space and BOM cost. For more information on 1.8V logic implementations, refer to *Simplifying Design with 1.8 V logic Muxes and Switches*.

7.3.4 Flat On-Resistance

The TMUX550x is designed with a special switch architecture to produce ultra-flat on-resistance (RON) across most of the switch input operating region. The flat RON response allows the device to be used in a wide variety of applications since the RON is controlled regardless of the signals sampled. The architecture is implemented without a charge pump so unwanted noise is not produced from the device to affect sampling accuracy.

This architecture also keeps RON the same regardless of the supply voltage. The flattest on-resistance region extends roughly from 5V above VSS to 5V below VDD. As long as this headroom is maintained, the TMUX550x exhibits an extremely linear response.

7.3.5 Power-Up Sequence Free

The TMUX550x supports any power up sequencing. With the supply rails (VDD and VSS), any rail can be powered on first. Similarly, when powering down the supply rails can be powered down in any order.

7.4 Device Functional Modes

When the EN pin of the TMUX550x is pulled high, one of the switches is closed based on the state of the address lines. When the EN pin is pulled low, all the switches are in an open state irrespective of the state of the address lines. The EN pin can be connected to V_{DD} (as high as 40V).

8 Device and Documentation Support

8.1 Documentation Support

8.1.1 Related Documentation

- Texas Instruments, *ADS866x 12-Bit, 500-kSPS, 4- and 8-Channel, Single-Supply, SAR ADCs with Bipolar Input Ranges*
- Texas Instruments, *OPAx140 High-Precision, Low-Noise, Rail-to-Rail Output, 11-MHz JFET Op Amp*
- Texas Instruments, *OPAx192 36-V, Precision, Rail-to-Rail Input/Output, Low Offset Voltage, Low Input Bias Current Op Amp with e-trim™*

8.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Notifications* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

8.3 Support Resources

TI E2E™ support forums are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

Linked content is provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's Terms of Use.

8.4 Trademarks

TI E2E™ is a trademark of Texas Instruments.
All trademarks are the property of their respective owners.

8.5 Electrostatic Discharge Caution

This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

8.6 Glossary

TI Glossary — This glossary lists and explains terms, acronyms, and definitions.

9 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

DATE	REVISION	NOTES
August 2026	*	Initial Release

10 Mechanical, Packaging, and Orderable Information

The following pages include mechanical packaging and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document. For browser-based versions of this data sheet, refer to the left-hand navigation.

ADVANCE INFORMATION

PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
PTMUX5508RSVR	Active	Preproduction	UQFN (RSV) | 16	3000 | LARGE T&R	-	Call TI	Call TI	-40 to 125	
PTMUX5509RSVR	Active	Preproduction	UQFN (RSV) | 16	3000 | LARGE T&R	-	Call TI	Call TI	-40 to 125	

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

GENERIC PACKAGE VIEW

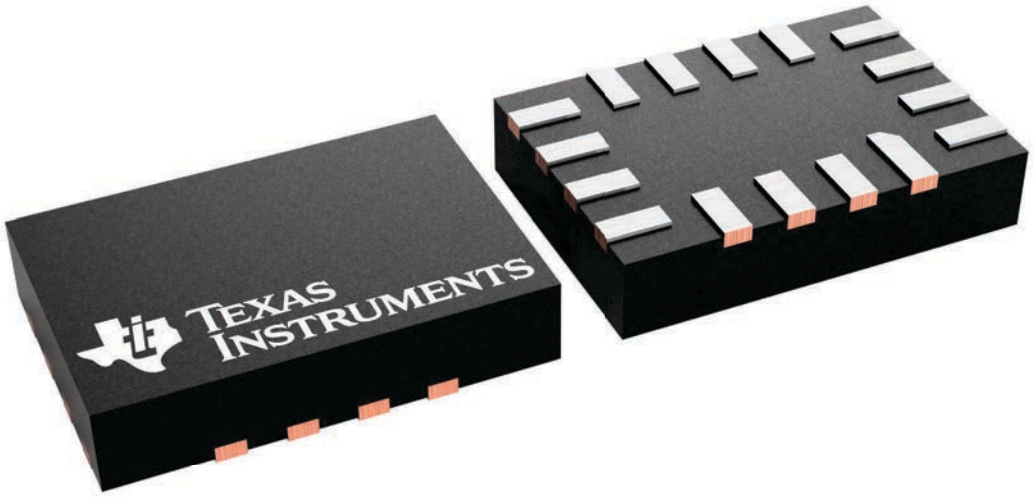
RSV 16

UQFN - 0.55 mm max height

1.8 x 2.6, 0.4 mm pitch

ULTRA THIN QUAD FLATPACK - NO LEAD

This image is a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.



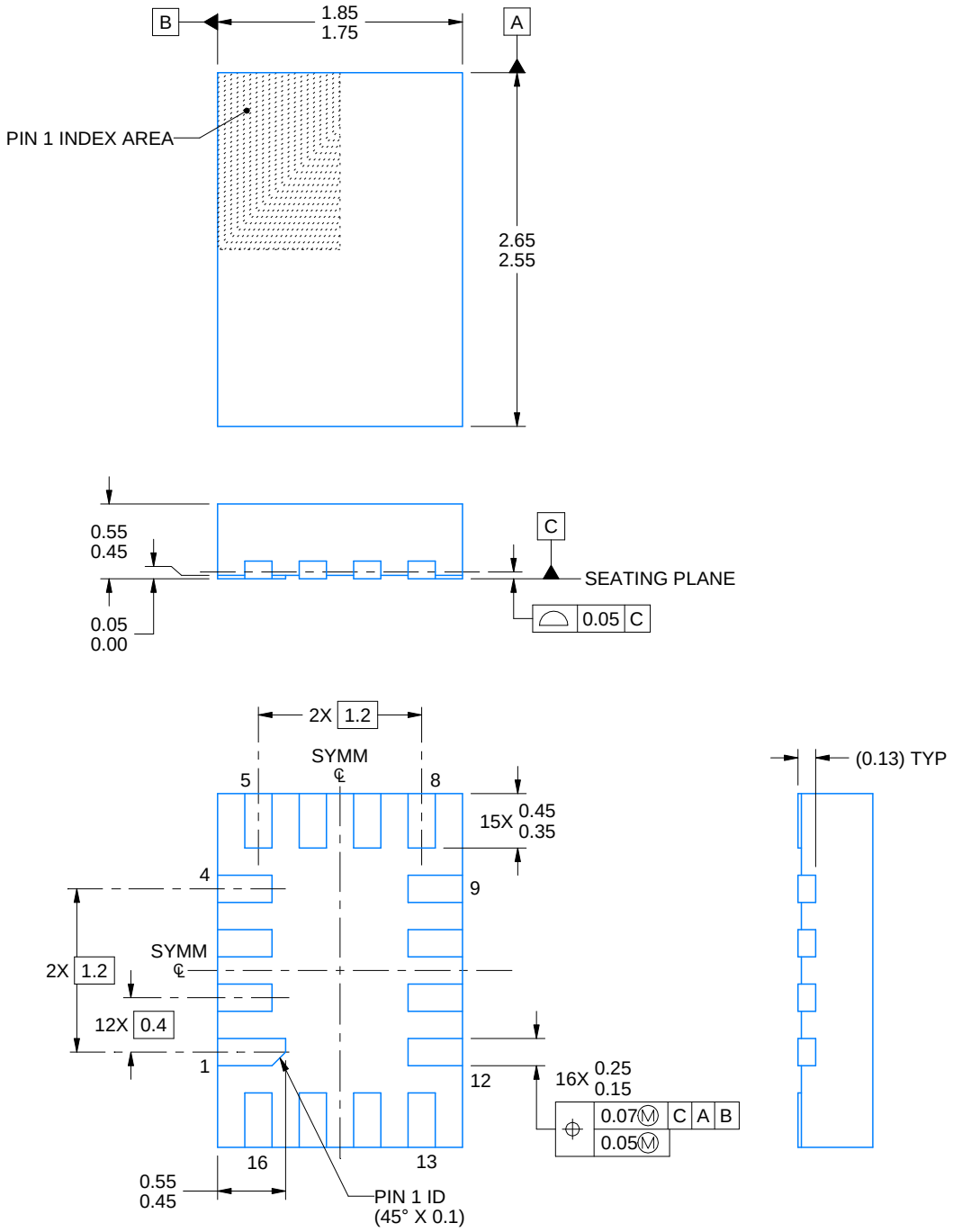
4231225/A

RSV0016A

PACKAGE OUTLINE

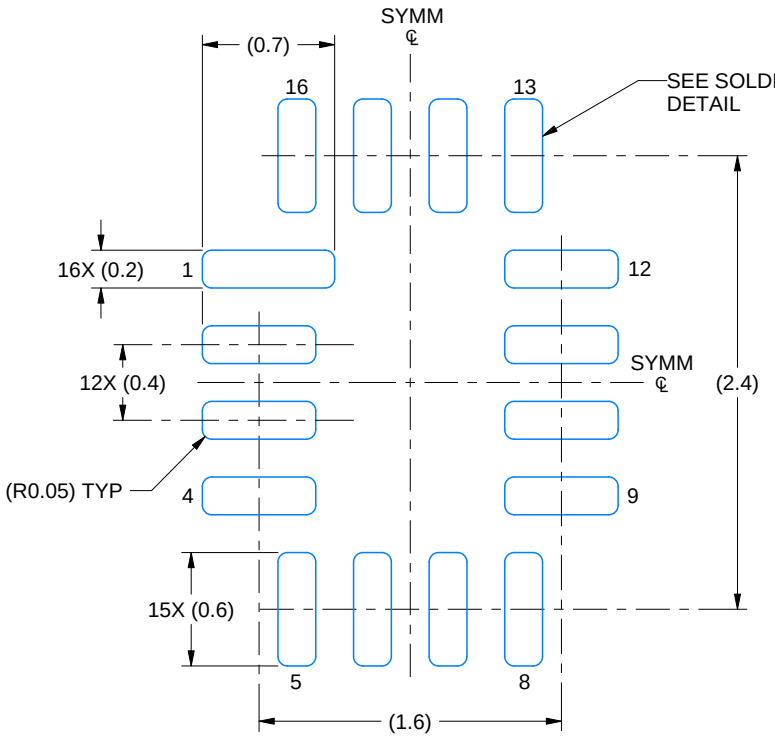
UQFN - 0.55 mm max height

ULTRA THIN QUAD FLATPACK - NO LEAD

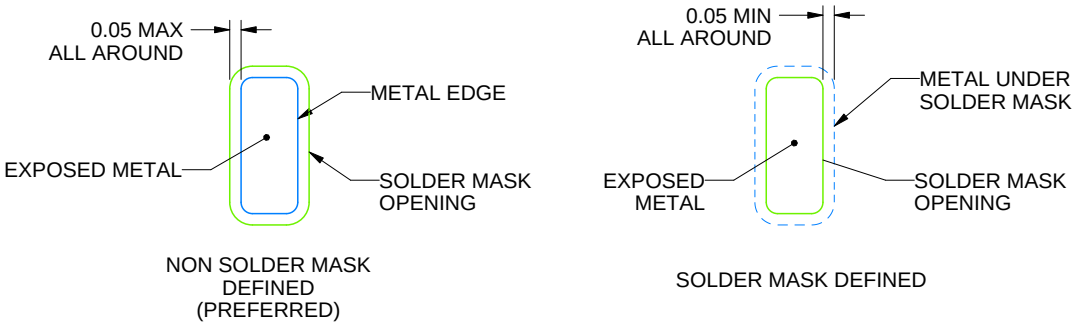


NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 25X

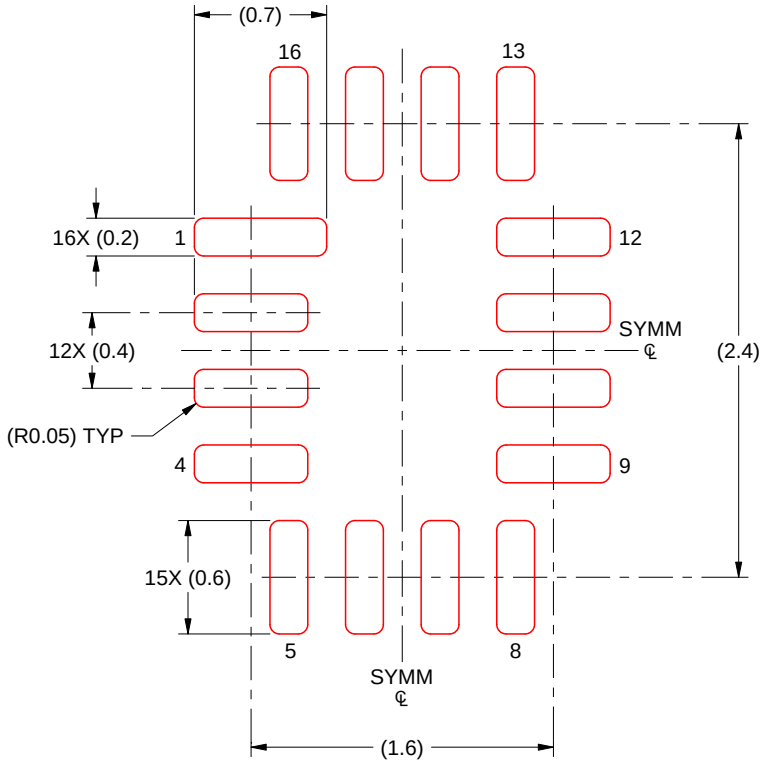


SOLDER MASK DETAILS

4220314/C 02/2020

NOTES: (continued)

3. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).



SOLDER PASTE EXAMPLE
BASED ON 0.125 MM THICK STENCIL
SCALE: 25X

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NOTES: (continued)

4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

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Last updated 10/2025