TS3A27518E 6-Channel (qSPI), 1:2 Multiplexer and Demultiplexer with Integrated IEC L-4 ESD and 1.8-V Logic Compatible Control Inputs

1 Features

- 1.65 V to 3.6 V single-supply operation
- Isolation in power-down mode, V_{CC} = 0
- Low-capacitance switches, 21.5 pF (typical)
- Bandwidth up to 240 MHz for high-speed rail-to-rail signal handling
- Crosstalk and OFF isolation of –62 dB
- 1.8 V logic compatible control inputs
- 3.6 V tolerant control inputs
- Latch-up performance exceeds 100 mA per JESD 78, Class II
- ESD performance tested per JESD 22
  - 2500-V human-body model (A114-B, Class II)
  - 1500-V charged-device model (C101)
- ESD performance: NC/NO ports
  - ±6-kV contact discharge (IEC 61000-4-2)
- 24-WQFN (4.00 mm × 4.00 mm) and 24-TSSOP (7.90 mm × 6.60 mm) packages

2 Applications

- SD-SDIO and MMC two-port MUX
- PC VGA video MUX-video systems
- Audio and video signal routing

3 Description

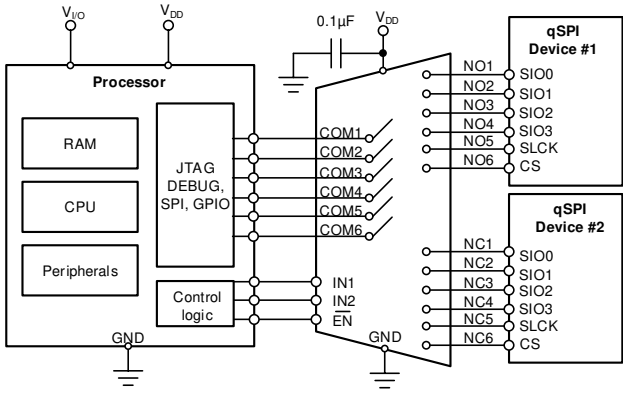
The TS3A27518E is a bidirectional, 6-channel, 1:2 multiplexer-demultiplexer designed to operate from 1.65 V to 3.6 V. This device can handle both digital and analog signals, and can transmit signals up to V_{CC} in either direction. The TS3A27518E has two control pins, each controlling three 1:2 muxes at the same time, and an enable pin that put all outputs in high-impedance mode. The control pins are compatible with 1.8 V logic thresholds and are backward compatible with 2.5 V and 3.3 V logic thresholds.

The TS3A27518E allows any SD, SDIO, and multimedia card host controllers to expand out to multiple cards or peripherals because the SDIO interface consists of 6-bits: CMD, CLK, and Data[0:3] signals. This device will support other 6-bit interfaces such a qSPI. The TS3A27518E has two control pins that give additional flexibility to the user. For example, the ability to mux two different audio-video signals in equipment such as an LCD television, an LCD monitor, or a notebook docking station.

Device Information(1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
TS3A27518E	WQFN (24)	4.00 mm × 4.00 mm
	TSSOP (24)	7.90 mm × 6.60 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.



Typical Application

An IMPORTANT NOTICE at the end of this data sheet addresses availability, warranty, changes, use in safety-critical applications, intellectual property matters and other important disclaimers. PRODUCTION DATA.

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4 Revision History

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

Changes from Revision E (May 2019) to Revision F (December 2021)	Page
• Updated the numbering format for tables, figures, and cross-references throughout the document	1
• Changed the maximum value for the digital input voltage From: V_{CC} To: *3.6 V*	5
• Changed the unit for the r_{on} analog switch From: *V* To: *Ω*	6

Changes from Revision D (May 2016) to Revision E (March 2019)	Page
• Removed the *BGA MICROSTAR JUNIOR (24)* package from the data sheet	1
• Changed the *Typical Application*	1
• Removed the *BGA MICROSTAR JUNIOR (24)* package	1
• Changed the *Pin Configuration* images	3
• Removed Note: "The input and output voltage ratings..." from the *Absolute Maximum Ratings* table	5
• Removed Note: "This value is limited to 5.5-V maximum" from the *Absolute Maximum Ratings* table	5
• Changed the *Application Information* section	19
• Added Figure 9-2	19

Changes from Revision C (December 2015) to Revision D (May 2016)	Page
• Updated *Pin Functions* table	1

Changes from Revision B (May 2009) to Revision C (December 2015)	Page
• Added *ESD Ratings* table, *Feature Description* section, *Device Functional Modes*, *Application and Implementation* section, *Power Supply Recommendations* section, *Layout* section, *Device and Documentation Support* section, and *Mechanical, Packaging, and Orderable Information* section	1

Changes from Revision A (March 2009) to Revision B (May 2009)	Page
• Changed the data sheet From: *Product Preview* To: *Production* data	1

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5 Pin Configuration and Functions

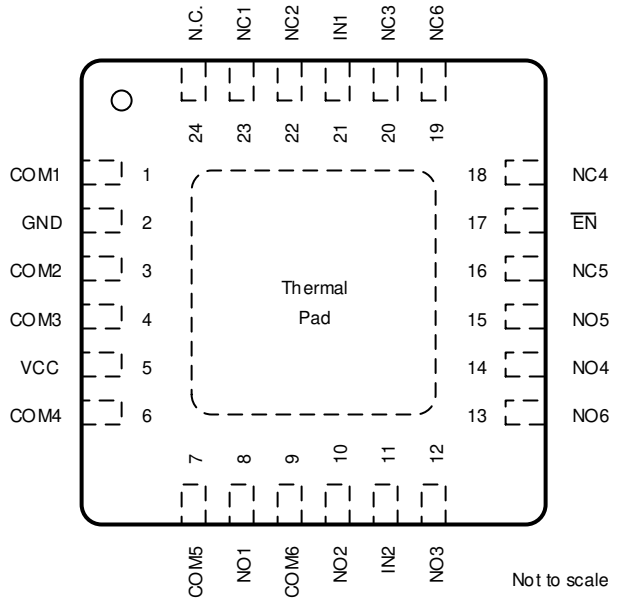

Figure 5-1. RTW Package
24-Pin WQFN
Top View

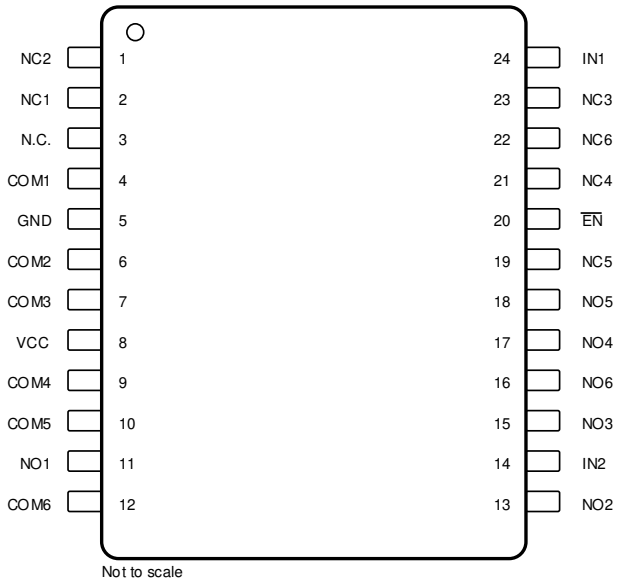

Figure 5-2. PW Package
24-Pin TSSOP
Top View

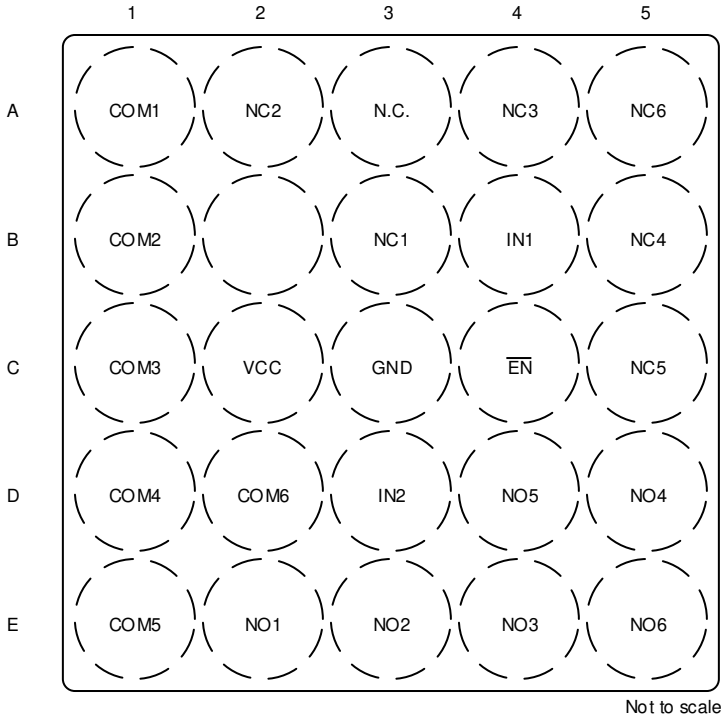

Figure 5-3. ZQS Package
24-Pin BGA MICROSTAR JUNIOR
Top View

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Table 5-1. Pin Functions

PIN				I/O	DESCRIPTION
NAME	RTW	ZQS	PW		
COM1	1	A1	4	I/O	Common-signal path
COM2	3	B1	6	I/O	Common-signal path
COM3	4	C1	7	I/O	Common-signal path
COM4	6	D1	9	I/O	Common-signal path
COM5	7	E1	10	I/O	Common-signal path
COM6	9	D2	12	I/O	Common-signal path
$\overline{EN}$	17	C4	20	I	Digital control to enable or disable all signal paths
GND	2	C3	5	—	Ground.
IN1	21	B4	24	I	Digital control to connect COM to NC or NO
IN2	11	D3	14	I	Digital control to connect COM to NC or NO
N.C.	24	A3	3	—	Not connected
NC1	23	B3	2	I/O	Normally closed-signal path
NC2	22	A2	1	I/O	Normally closed-signal path
NC3	20	A4	23	I/O	Normally closed-signal path
NC4	18	B5	21	I/O	Normally closed-signal path
NC5	16	C5	19	I/O	Normally closed-signal path
NC6	19	A5	22	I/O	Normally closed-signal path
NO1	8	E2	11	I/O	Normally open-signal path
NO2	10	E3	13	I/O	Normally open-signal path
NO3	12	E4	15	I/O	Normally open-signal path
NO4	14	D5	17	I/O	Normally open-signal path
NO5	15	D4	18	I/O	Normally open-signal path
NO6	13	E5	16	I/O	Normally open-signal path
V_{CC}	5	C2	8	—	Voltage supply

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6 Specifications

6.1 Absolute Maximum Ratings

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

			MIN	MAX	UNIT
V_{CC}	Supply voltage (3)		–0.5	4.6	V
V_{NC} V_{NO} V_{COM}	Analog signal voltage (3)		–0.5	4.6	V
I_K	Analog port diode current (4)	$V_{CC} < V_{NC}, V_{NO}, V_{COM} < 0$	–50		mA
I_{NC} I_{NO} I_{COM}	ON-state switch current (5)	V_{NC}, V_{NO}, V_{COM} = 0 to V_{CC}	–50	50	mA
V_I	Digital input voltage (3)		–0.5	4.6	V
I_{IK}	Digital input clamp current (3)	$V_{IO} < V_I < 0$	–50		mA
I_{CC}	Continuous current through V_{CC}			100	mA
I_{GND}	Continuous current through GND		–100		mA
T_{stg}	Storage temperature		–65	150	°C

(1) Stresses beyond those listed under *Absolute Maximum Ratings* may cause permanent damage to the device. These are stress ratings only, which do not imply functional operation of the device at these or any other conditions beyond those indicated under *Recommended Operating Conditions*. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum.
(3) All voltages are with respect to ground, unless otherwise specified.
(4) Requires clamp diodes on analog port to V_{CC}.
(5) Pulse at 1-ms duration < 10% duty cycle.

6.2 ESD Ratings

			VALUE	UNIT
$V_{(ESD)}$	Electrostatic discharge	Human-body model (HBM), per ANSI/ESDA/JEDEC JS-001 (1)	±2500	V
		Charged-device model (CDM), per JEDEC specification JESD22-C101 or ANSI/ESDA/JEDEC JS-002 (2)	±1500	

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

6.3 Recommended Operating Conditions

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

		MIN	MAX	UNIT
Supply voltage	V_{CC}	1.65	3.6	V
Analog signal voltage	V_{NC}	0	3.6	V
	V_{NO}			
	V_{COM}			
Digital input voltage	V_I	0	3.6	V

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6.4 Thermal Information

THERMAL METRIC (1)		TS3A27518E			UNIT
		PW (TSSOP)	RTW (WQFN)	ZQS (BGA MICROSTAR JUNIOR)	
		24 PINS	24 PINS	24 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	104	40.7	155.7	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	51.6	42.9	69.9	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	57.5	19.2	94.6	°C/W
ψ_{JT}	Junction-to-top characterization parameter	9.9	1	9	°C/W
ψ_{JB}	Junction-to-board characterization parameter	57.1	19.3	92.2	°C/W
$R_{\theta JC(bot)}$	Junction-to-case (bottom) thermal resistance	—	8	—	°C/W

(1) For more information about traditional and new thermal metrics, see the *Semiconductor and IC Package Thermal Metrics* application report.

6.5 Electrical Characteristics for 3.3-V Supply

V_{CC} = 3 V to 3.6 V, T_A = –40°C to +85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS				MIN	TYP	MAX	UNIT
ANALOG SWITCH									
V_{COM}, V_{NO}, V_{NC}	Analog signal voltage					0		3.6	V
r_{on}	ON-state resistance	V_{CC} = 3 V	0 ≤ (V_{NC} or V_{NO}) ≤ V_{CC}, I_{COM} = –32 mA	Switch ON, see Figure 7-1	T_A = 25°C		4.4	6.2	Ω
					T_A = –40°C to +85°C			7.6	
Δr_{on}	ON-state resistance match between channels	V_{CC} = 3 V	V_{NC} or V_{NO} = 2.1 V, I_{COM} = –32 mA	Switch ON, see Figure 7-1	T_A = 25°C		0.3	0.7	Ω
					T_A = –40°C to +85°C			0.8	
$r_{on(flat)}$	ON-state resistance flatness	V_{CC} = 3 V	0 ≤ (V_{NC} or V_{NO}) ≤ V_{CC}, I_{COM} = –32 mA	Switch ON, see Figure 7-2	T_A = 25°C		0.95	2.1	Ω
					T_A = –40°C to +85°C			2.3	
$I_{NC(OFF)}$, $I_{NO(OFF)}$	NC, NO OFF leakage current	V_{CC} = 3.6 V	V_{NC} or V_{NO} = 1 V, V_{COM} = 3 V, or V_{NC} or V_{NO} = 3 V, V_{COM} = 1 V	Switch OFF, see Figure 7-2	T_A = 25°C	–0.5	0.05	0.5	µA
					T_A = –40°C to +85°C	–7		7	
$I_{NC(PWROFF)}$, $I_{NO(PWROFF)}$		V_{CC} = 0 V	V_{NC} or V_{NO} = 0 to 3.6 V, V_{COM} = 3.6 V to 0, or V_{NC} or V_{NO} = 3.6 V to 0, V_{COM} = 0 to 3.6 V		T_A = 25°C	–1	0.05	1	
					T_A = –40°C to +85°C	–12		12	
$I_{COM(OFF)}$	COM OFF leakage current	V_{CC} = 3.6 V	V_{NC} or V_{NO} = 3 V, V_{COM} = 1 V, or V_{NC} or V_{NO} = 1 V, V_{COM} = 3 V	Switch OFF, see Figure 7-2	T_A = 25°C	–1	0.01	1	µA
					T_A = –40°C to +85°C	–2		2	
$I_{COM(PWROFF)}$		V_{CC} = 0 V	V_{NC} or V_{NO} = 3.6 V to 0, V_{COM} = 0 to 3.6 V, or V_{NC} or V_{NO} = 0 to 3.6 V, V_{COM} = 3.6 V to 0		T_A = 25°C	–1	0.02	1	
					T_A = –40°C to +85°C	–12		1	

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6.5 Electrical Characteristics for 3.3-V Supply (continued)

V_{CC} = 3 V to 3.6 V, T_A = –40°C to +85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS				MIN	TYP	MAX	UNIT
$I_{NO(ON)}$, $I_{NC(ON)}$	NC, NO ON leakage current	V_{CC} = 3.6 V	V_{NC} or V_{NO} = 1 V, V_{COM} = open, or V_{NC} or V_{NO} = 3 V, V_{COM} = open	Switch ON, see Figure 7-3	T_A = 25°C	–2.5	0.04	2.2	µA
					T_A = –40°C to +85°C	–7		7	
$I_{COM(ON)}$	COM ON leakage current	V_{CC} = 3.6 V	V_{NC} or V_{NO} = open, V_{COM} = 1 V, or V_{NC} or V_{NO} = open, V_{COM} = 3 V	Switch ON, see Figure 7-3	T_A = 25°C	–2	0.03	2	µA
					T_A = –40°C to +85°C	–7		7	
DIGITAL CONTROL INPUTS (IN1, IN2, $\overline{EN}$) (1)									
V_{IH}	Input logic high	V_{CC} = 3.6 V			T_A = –40°C to +85°C	1.2		3.6	V
V_{IL}	Input logic low	V_{CC} = 3.6 V			T_A = –40°C to +85°C	0		0.65	V
I_{IH}, I_{IL}	Input leakage current	V_{CC} = 3.6 V	V_I = V_{CC} or 0		T_A = 25°C	–0.1	0.05	0.1	µA
					T_A = –40°C to +85°C	–2.5		2.5	
DYNAMIC									
t_{ON}	Turnon time	V_{CC} = 3.3 V	V_{COM} = V_{CC}, R_L = 50 Ω	C_L = 35 pF, see Figure 7-5	T_A = 25°C		18.1	59	ns
		V_{CC} = 3 V to 3.6 V			T_A = –40°C to +85°C			60	
t_{OFF}	Turnoff time	V_{CC} = 3.3 V	V_{COM} = V_{CC}, R_L = 50 Ω	C_L = 35 pF, see Figure 7-5	T_A = 25°C		25.4	60.6	ns
		V_{CC} = 3 V to 3.6 V			T_A = –40°C to +85°C			61	
t_{BBM}	Break-before-make time	V_{CC} = 3.3 V	V_{NC} = V_{NO} = V_{CC}/2, R_L = 50 Ω	C_L = 35 pF, see Figure 7-6	T_A = 25°C	4	11.1	22.7	ns
		V_{CC} = 3 V to 3.6 V			T_A = –40°C to +85°C			28	
Q_C	Charge injection	V_{CC} = 3.3 V	V_{GEN} = 0, R_{GEN} = 0	C_L = 0.1 nF, see Figure 7-10	T_A = 25°C		0.81		pC
$C_{NC(OFF)}$, $C_{NO(OFF)}$	NC, NO OFF capacitance	V_{CC} = 3.3 V	V_{NC} or V_{NO} = V_{CC} or GND, Switch OFF	See Figure 7-4	T_A = 25°C		13		pF
$C_{COM(OFF)}$	COM OFF capacitance	V_{CC} = 3.3 V	V_{NC} or V_{NO} = V_{CC} or GND, Switch OFF	See Figure 7-4	T_A = –40°C to +85°C		8.5		pF
$C_{NC(ON)}$, $C_{NO(ON)}$	NC, NO ON capacitance	V_{CC} = 3.3 V	V_{NC} or V_{NO} = V_{CC} or GND, Switch OFF	See Figure 7-4			21.5		pF
$C_{COM(ON)}$	COM ON capacitance	V_{CC} = 3.3 V	V_{COM} = V_{CC} or GND, Switch ON	See Figure 7-4			21.5		pF
C_I	Digital input capacitance	V_{CC} = 3.3 V	V_I = V_{CC} or GND	See Figure 7-4			2		pF
BW	Bandwidth	V_{CC} = 3.3 V	R_L = 50 Ω,	Switch ON, see Figure 7-6			240		MHz
O_{ISO}	OFF isolation	V_{CC} = 3.3 V	R_L = 50 Ω, f = 10 MHz	Switch OFF, see Figure 7-8			–62		dB
X_{TALK}	Crosstalk	V_{CC} = 3.3 V	R_L = 50 Ω, f = 10 MHz	Switch ON, see Figure 7-9			–62		dB
$X_{TALK(ADJ)}$	Crosstalk adjacent	V_{CC} = 3.3 V	R_L = 50 Ω, f = 10 MHz	Switch ON, see Figure 7-9			–71		dB
THD	Total harmonic distortion	V_{CC} = 3.3 V	R_L = 600 Ω, C_L = 50 pF	f = 20 Hz to 20 kHz, see Figure 7-11			0.05%		

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6.5 Electrical Characteristics for 3.3-V Supply (continued)

V_{CC} = 3 V to 3.6 V, T_A = –40°C to +85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS				MIN	TYP	MAX	UNIT
SUPPLY									
I_{CC}	Positive supply current	V_{CC} = 3.6 V	V_I = V_{CC} or GND	Switch ON or OFF	T_A = 25°C		0.04	0.3	µA
					T_A = –40°C to +85°C			3	

(1) All unused digital inputs of the device must be held at V_{CC} or GND to ensure proper device operation. See the TI application report, *Implications of Slow or Floating CMOS Inputs*, SCBA004.

6.6 Electrical Characteristics for 2.5-V Supply

V_{CC} = 2.3 V to 2.7 V, T_A = –40°C to +85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS				MIN	TYP	MAX	UNIT
ANALOG SWITCH									
V_{COM}, V_{NO}, V_{NC}	Analog signal voltage					0		3.6	V
r_{on}	ON-state resistance	V_{CC} = 2.3 V	0 ≤ (V_{NC} or V_{NO}) ≤ V_{CC}, I_{COM} = –32 mA	Switch ON, see Figure 7-1	T_A = 25°C		5.5	9.6	Ω
					T_A = –40°C to +85°C			11.5	
Δr_{on}	ON-state resistance match between channels	V_{CC} = 2.3 V	V_{NC} or V_{NO} = 1.6 V, I_{COM} = –32 mA	Switch ON, see Figure 7-1	T_A = 25°C		0.3	0.8	Ω
					T_A = –40°C to +85°C			0.9	
$r_{on(flat)}$	ON-state resistance flatness	V_{CC} = 2.3 V	0 ≤ (V_{NC} or V_{NO}) ≤ V_{CC}, I_{COM} = –32 mA	Switch ON, see Figure 7-2	T_A = 25°C		0.91	2.2	Ω
					T_A = –40°C to +85°C			2.3	
$I_{NC(OFF)}$, $I_{NO(OFF)}$	NC, NO OFF leakage current	V_{CC} = 2.7 V	V_{NC} or V_{NO} = 0.5 V, V_{COM} = 2.3 V, or V_{NC} or V_{NO} = 2.3 V, V_{COM} = 0.5 V	Switch OFF, see Figure 7-2	T_A = 25°C	–0.3	0.04	0.3	µA
					T_A = –40°C to +85°C	–6		6	
$I_{NC(PWROFF)}$, $I_{NO(PWROFF)}$		V_{CC} = 0 V	V_{NC} or V_{NO} = 0 to 2.7 V, V_{COM} =2.7 V to 0, or V_{NC} or V_{NO} = 2.7 V to 0, V_{COM} = 0 to 2.7 V		T_A = 25°C	–0.6	0.02	0.6	
					T_A = –40°C to +85°C	–10		10	
$I_{COM(OFF)}$	COM OFF leakage current	V_{CC} = 2.7 V	V_{NC} or V_{NO} = 0.5 V, V_{COM} = 2.3 V, or V_{NC} or V_{NO} = 2.3 V, V_{COM} = 0.5 V	Switch OFF, see Figure 7-2	T_A = 25°C	–0.7	0.02	0.7	µA
					T_A = –40°C to +85°C	–1		1	
$I_{COM(PWROFF)}$		V_{CC} = 0 V	V_{NC} or V_{NO} = 2.7 V to 0, V_{COM} = 0 to 2.7 V, or V_{NC} or V_{NO} = 0 to 2.7 V, V_{COM} = 2.7 V to 0		T_A = 25°C	–0.7	0.02	0.7	
					T_A = –40°C to +85°C	–7.2		7.2	
$I_{NO(ON)}$ $I_{NC(ON)}$	NC, NO ON leakage current	V_{CC} = 2.7 V	V_{NC} or V_{NO} = 0.5 V or 2.3 V, V_{COM} = open	Switch ON, see Figure 7-3	T_A = 25°C	–2.1	0.03	2.1	µA
					T_A = –40°C to +85°C	–6		6	
$I_{COM(ON)}$	COM ON leakage current	V_{CC} = 2.7 V	V_{NC} or V_{NO} = open, V_{COM} = 0.5 V, or V_{NC} or V_{NO} = open, V_{COM} = 2.3 V	Switch ON, see Figure 7-3	T_A = 25°C	–2	0.02	2	µA
					T_A = –40°C to +85°C	–5.7		5.7	
DIGITAL CONTROL INPUTS (IN1, IN2, $\overline{EN}$) (1)									
V_{IH}	Input logic high	V_{CC} = 2.7 V	V_I = V_{CC} or GND		T_A = –40°C to +85°C	1.15		3.6	V
V_{IL}	Input logic low	V_{CC} = 2.7 V				0		0.55	V
I_{IH}, I_{IL}	Input leakage current	V_{CC} = 2.7 V	V_I = V_{CC} or 0		T_A = 25°C	–0.1	0.01	0.1	µA
					T_A = –40°C to +85°C	–2.1		2.1	

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6.6 Electrical Characteristics for 2.5-V Supply (continued)

V_{CC} = 2.3 V to 2.7 V, T_A = –40°C to +85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS				MIN	TYP	MAX	UNIT
DYNAMIC									
t_{ON}	Turnon time	V_{CC} = 2.5 V	V_{COM} = VCC, R_L = 50 Ω	C_L = 35 pF, see Figure 7-5	T_A = 25°C		17.2	36.8	ns
		V_{CC} = 2.3 V to 2.7 V			T_A = –40°C to +85°C			42.5	
t_{OFF}	Turnoff time	V_{CC} = 2.5 V	V_{COM} = VCC, R_L = 50 Ω	C_L = 35 pF, see Figure 7-5	T_A = 25°C		17.1	29.8	ns
		V_{CC} = 2.3 V to 2.7 V			T_A = –40°C to +85°C			34.4	
t_{BBM}	Break-before-make time	V_{CC} = 2.5 V	V_{NC} = V_{NO} = V_{CC}/2, R_L = 50 Ω	C_L = 35 pF, see Figure 7-6	T_A = 25°C	4.5	13	30	ns
		V_{CC} = 2.3 V to 2.7 V			T_A = –40°C to +85°C			33.3	
Q_C	Charge injection	V_{CC} = 2.5 V	V_{GEN} = 0, R_{GEN} = 0	C_L = 0.1 nF, see Figure 7-10			0.47		pC
$C_{NC(OFF)}$, $C_{NO(OFF)}$	NC, NO OFF capacitance	V_{CC} = 2.5 V	V_{NC} or V_{NO} = V_{CC} or GND, switch OFF	See Figure 7-4			13.5		pF
$C_{COM(OFF)}$	COM OFF capacitance	V_{CC} = 2.5 V	V_{NC} or V_{NO} = V_{CC} or GND, switch OFF	See Figure 7-4	T_A = –40°C to +85°C		9		pF
$C_{NC(ON)}$, $C_{NO(ON)}$	NC, NO ON capacitance	V_{CC} = 2.5 V	V_{NC} or V_{NO} = V_{CC} or GND, switch OFF	See Figure 7-4			22		pF
$C_{COM(ON)}$	COM ON capacitance	V_{CC} = 2.5 V	V_{COM} = V_{CC} or GND, switch ON	See Figure 7-4			22		pF
C_I	Digital input capacitance	V_{CC} = 2.5 V	V_I = V_{CC} or GND	See Figure 7-4			2		pF
BW	Bandwidth	V_{CC} = 2.5 V	R_L = 50 Ω	Switch ON, see Figure 7-6			240		MHz
O_{ISO}	OFF isolation	V_{CC} = 2.5 V	R_L = 50 Ω, f = 10 MHz	Switch OFF, see Figure 7-8			–62		dB
X_{TALK}	Crosstalk	V_{CC} = 2.5 V	R_L = 50 Ω, f = 10 MHz	Switch ON, see Figure 7-9			–62		dB
$X_{TALK(ADJ)}$	Crosstalk adjacent	V_{CC} = 2.5 V	R_L = 50 Ω, f = 10 MHz	Switch ON, see Figure 7-9			–71		dB
THD	Total harmonic distortion	V_{CC} = 2.5 V	R_L = 600 Ω, C_L = 50 pF	f = 20 Hz to 20 kHz, see Figure 7-11			0.06%		
SUPPLY									
I_{CC}	Positive supply current	V_{CC} = 2.7 V	V_I = V_{CC} or GND	Switch ON or OFF	T_A = 25°C		0.01	0.1	μA
					T_A = –40°C to +85°C			2	

(1) All unused digital inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, SCBA004.

6.7 Electrical Characteristics for 1.8-V Supply

V_{CC} = 1.65 V to 1.95 V, T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS				MIN	TYP	MAX	UNIT
ANALOG SWITCH									
V_{COM}, V_{NO}, V_{NC}	Analog signal voltage					0		3.6	V
r_{on}	ON-state resistance	V_{CC} = 1.65 V	0 ≤ (V_{NC} or V_{NO}) ≤ V_{CC}, I_{COM} = –32 mA	Switch ON, see Figure 7-1	T_A = 25°C		7.1	14.4	Ω
					T_A = –40°C to +85°C			16.3	

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6.7 Electrical Characteristics for 1.8-V Supply (continued)

V_{CC} = 1.65 V to 1.95 V, T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS				MIN	TYP	MAX	UNIT
Δr_{on}	ON-state resistance match between channels	V_{CC} = 1.65 V	V_{NC} or V_{NO} = 1.5 V, I_{COM} = –32 mA	Switch ON, see Figure 7-1	T_A = 25°C		0.3	1	Ω
					T_A = –40°C to +85°C			1.2	
$r_{on(flat)}$	ON-state resistance flatness	V_{CC} = 1.65 V	0 ≤ (V_{NC} or V_{NO}) ≤ V_{CC}, I_{COM} = –32 mA	Switch ON, see Figure 7-2	T_A = 25°C		2.7	5.5	Ω
					T_A = –40°C to +85°C			7.3	
$I_{NC(OFF)}$, $I_{NO(OFF)}$	NC, NO OFF leakage current	V_{CC} = 1.95 V	V_{NC} or V_{NO} = 0.3 V, V_{COM} = 1.65 V, or V_{NC} or V_{NO} = 1.65 V, V_{COM} = 0.3 V	Switch OFF, see Figure 7-2	T_A = 25°C	–0.25	0.03	0.25	µA
					T_A = –40°C to +85°C	–5		5	
$I_{NC(PWROFF)}$, $I_{NO(PWROFF)}$		V_{CC} = 0 V	V_{NC} or V_{NO} = 1.95 V to 0, V_{COM} = 0 to 1.95 V, or V_{NC} or V_{NO} = 0 to 1.95 V, V_{COM} = 1.95 V to 0		T_A = 25°C	–0.4	0.01	0.4	µA
					T_A = –40°C to +85°C	–7.2		7.2	
$I_{COM(OFF)}$	COM OFF leakage current	V_{CC} = 1.95 V	V_{NC} or V_{NO} = 0.3 V, V_{COM} = 1.65 V, or V_{NC} or V_{NO} = 1.65 V, V_{COM} = 0.3 V	Switch OFF, see Figure 7-2	T_A = 25°C	–0.4	0.02	0.4	µA
					T_A = –40°C to +85°C	–0.9		0.9	
$I_{COM(PWROFF)}$		V_{CC} = 0 V	V_{NC} or V_{NO} = 1.95 V to 0, V_{COM} = 0 to 1.95 V, or V_{NC} or V_{NO} = 0 to 1.95 V, V_{COM} = 1.95 V to 0		T_A = 25°C	–0.4	0.02	0.4	µA
					T_A = –40°C to +85°C	–5		5	
$I_{NO(ON)}$, $I_{NC(ON)}$	NC, NO ON leakage current	V_{CC} = 1.95 V	V_{NC} or V_{NO} = 0.3 V, V_{COM} = open, or V_{NC} or V_{NO} = 1.65 V, V_{COM} = open	Switch ON, see Figure 7-3	T_A = 25°C	–2	0.02	2	µA
					T_A = –40°C to +85°C	–5.2		5.2	
$I_{COM(ON)}$	COM ON leakage current	V_{CC} = 1.95 V	V_{NC} or V_{NO} = open, V_{COM} = 0.3 V, or V_{NC} or V_{NO} = open, V_{COM} = 1.65 V	Switch ON, see Figure 7-3	T_A = 25°C	–2	0.02	2	µA
					T_A = –40°C to +85°C	–5.2		5.2	
DIGITAL CONTROL INPUTS (IN1, IN2, $\overline{EN}$) (1)									
V_{IH}	Input logic high	V_{CC} = 1.95 V	V_I = V_{CC} or GND		T_A = –40°C to +85°C	1		3.6	V
V_{IL}	Input logic low	V_{CC} = 1.95 V			T_A = –40°C to +85°C	0		0.4	V
I_{IH}, I_{IL}	Input leakage current	V_{CC} = 1.95 V	V_I = V_{CC} or 0		T_A = 25°C	–0.1	0.01	0.1	µA
					T_A = –40°C to +85°C	–2.1		2.1	
DYNAMIC									
t_{ON}	Turnon time	V_{CC} = 1.8 V	V_{COM} = V_{CC}, R_L = 50 Ω	C_L = 35 pF, see Figure 7-5	T_A = 25°C		14.1	49.3	ns
		V_{CC} = 1.65 V to 1.95 V			T_A = –40°C to +85°C			56.7	
t_{OFF}	Turnoff time	V_{CC} = 1.8 V	V_{COM} = V_{CC}, R_L = 50 Ω	C_L = 35 pF, see Figure 7-5	T_A = 25°C		16.1	26.5	ns
		V_{CC} = 1.65 V to 1.95 V			T_A = –40°C to +85°C			31.2	
t_{BBM}	Break-before-make time	V_{CC} = 1.8 V	V_{NC} = V_{NO} = V_{CC}/2, R_L = 50 Ω	C_L = 35 pF, see Figure 7-6	T_A = 25°C	5.3	18.4	58	ns
		V_{CC} = 1.65 V to 1.95 V			T_A = –40°C to +85°C			58	
Q_C	Charge injection	V_{CC} = 1.8 V	V_{GEN} = 0, R_{GEN} = 0	C_L = 1 nF, see Figure 7-10			0.21		pC

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6.7 Electrical Characteristics for 1.8-V Supply (continued)

V_{CC} = 1.65 V to 1.95 V, T_A = –40°C to 85°C (unless otherwise noted)

PARAMETER		TEST CONDITIONS				MIN	TYP	MAX	UNIT
$C_{NC(OFF)}$, $C_{NO(OFF)}$	NC, NO OFF capacitance	V_{CC} = 1.8 V	V_{NC} or V_{NO} = V_{CC} or GND, switch OFF	See Figure 7-4			9		pF
$C_{NC(ON)}$, $C_{NO(ON)}$	NC, NO ON capacitance	V_{CC} = 1.8 V	V_{NC} or V_{NO} = V_{CC} or GND, switch OFF	See Figure 7-4			22		pF
$C_{COM(ON)}$	COM ON capacitance	V_{CC} = 1.8 V	V_{COM} = V_{CC} or GND, switch ON	See Figure 7-4			22		pF
C_I	Digital input capacitance	V_{CC} = 1.8 V	V_I = V_{CC} or GND	See Figure 7-4			2		pF
BW	Bandwidth	V_{CC} = 1.8 V	R_L = 50 Ω	Switch ON, see Figure 7-6			240		MHz
O_{ISO}	OFF isolation	V_{CC} = 1.8 V	R_L = 50 Ω, f = 10 MHz	Switch OFF, see Figure 7-8			–60		dB
X_{TALK}	Crosstalk	V_{CC} = 1.8 V	R_L = 50 Ω, f = 10 MHz	Switch ON, see Figure 7-9			–60		dB
$X_{TALK(ADJ)}$	Crosstalk adjacent	V_{CC} = 1.8 V	R_L = 50 Ω, f = 10 MHz	Switch ON, see Figure 7-9			–71		dB
THD	Total harmonic distortion	V_{CC} = 1.8 V	R_L = 600 Ω, C_L = 50 pF	f = 20 Hz to 20 kHz, see Figure 7-11			0.1%		
SUPPLY									
I_{CC}	Positive supply current	V_{CC} = 1.95 V	V_I = V_{CC} or GND	Switch ON or OFF	T_A = 25°C		0.01	0.1	µA
					T_A = –40°C to +85°C			1.5	

(1) All unused digital inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, SCBA004.

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6.8 Typical Characteristics

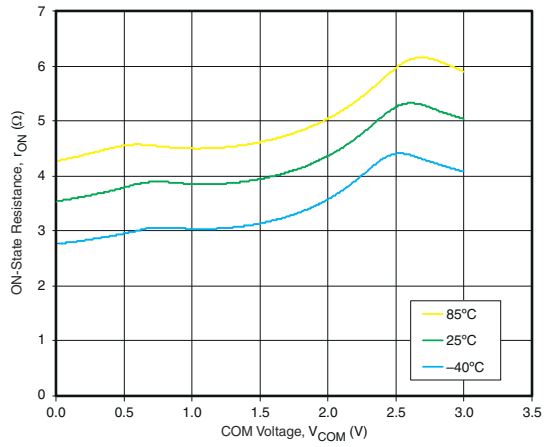

Figure 6-1. ON-State Resistance vs COM Voltage (V_{CC} = 3 V)

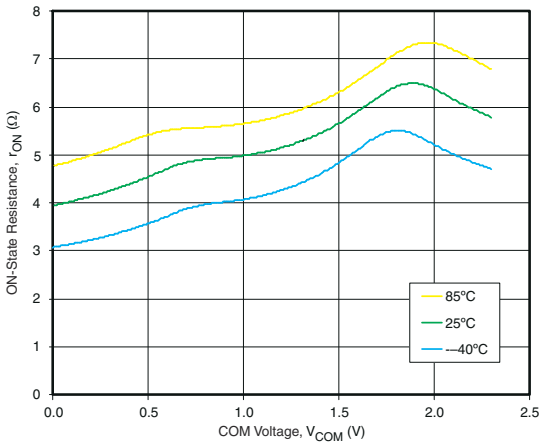

Figure 6-2. ON-State Resistance vs COM Voltage (V_{CC} = 2.3 V)

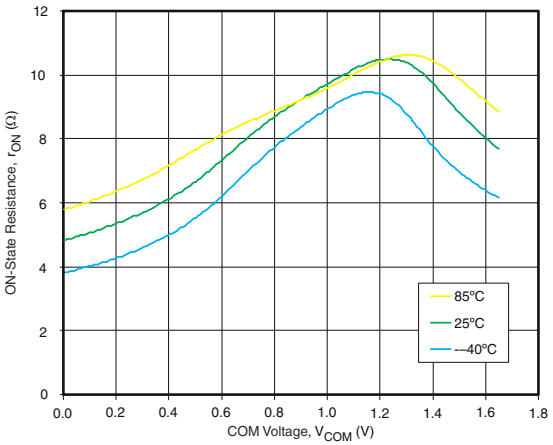

Figure 6-3. ON-State Resistance vs COM Voltage (V_{CC} = 1.65 V)

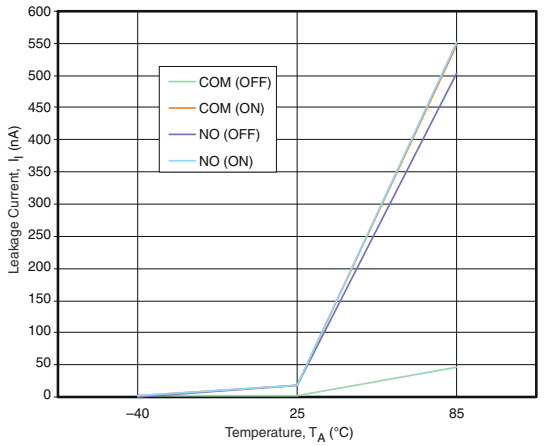

Figure 6-4. Leakage Current vs Temperature (V_{CC} = 3.3 V)

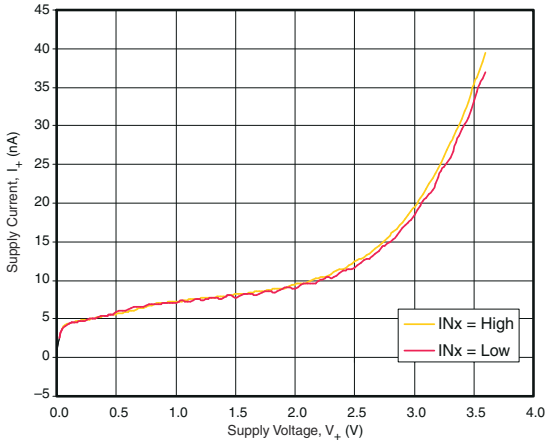

Figure 6-5. Supply Current vs Supply Voltage

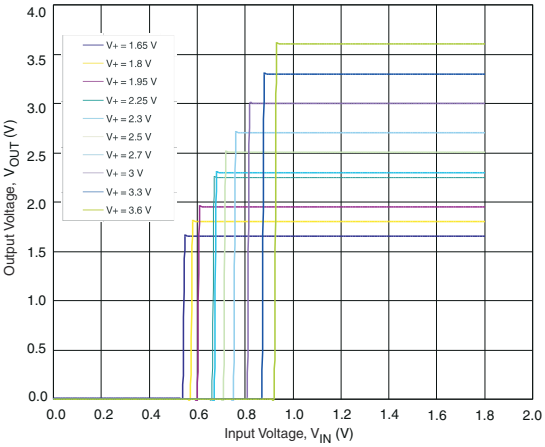

Figure 6-6. Control Input Thresholds (IN1, T_A = 25°C)

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6.8 Typical Characteristics (continued)

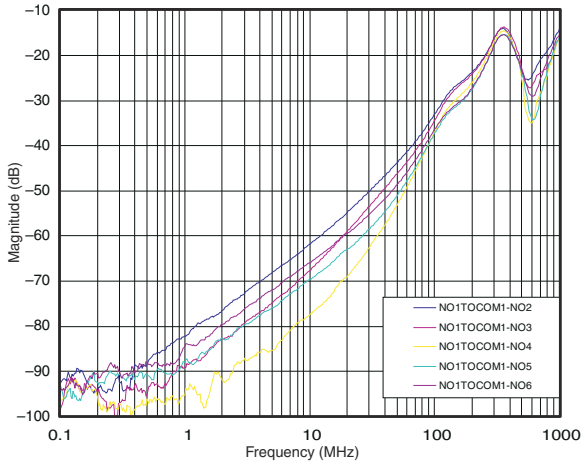

Figure 6-7. Crosstalk Adjacent

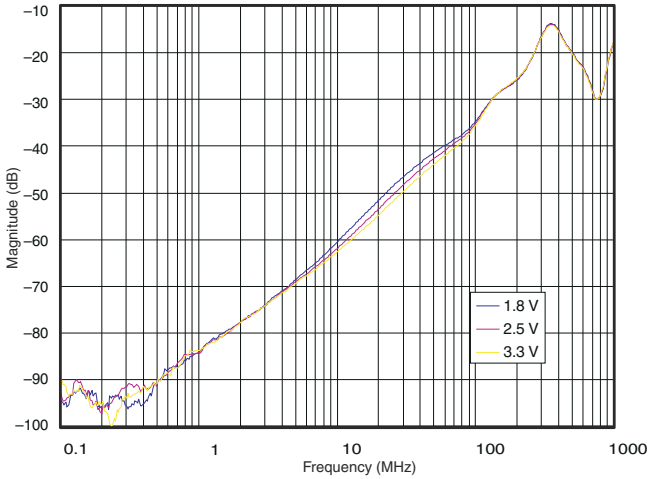

Figure 6-8. Crosstalk

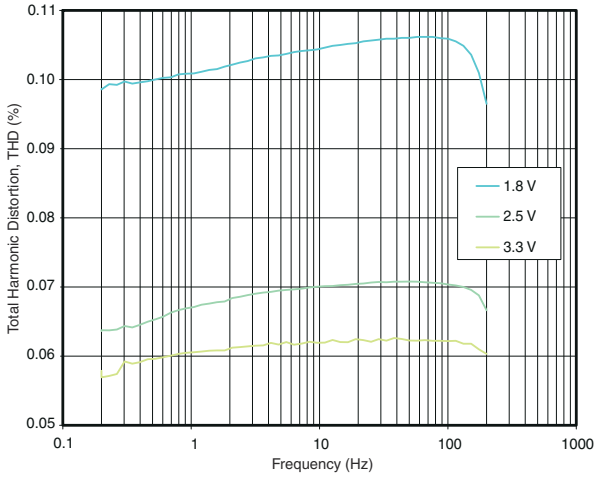

Figure 6-9. Total Harmonic Distortion vs Frequency

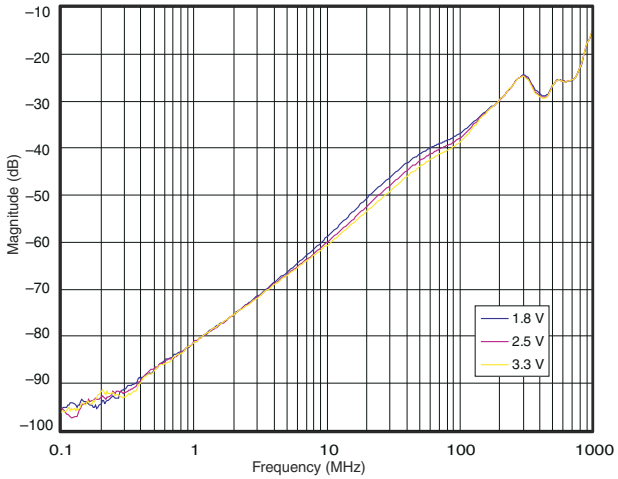

Figure 6-10. OFF Isolation

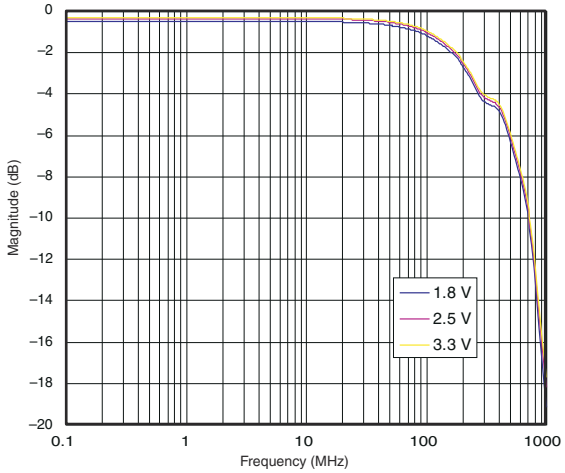

Figure 6-11. Insertion Loss

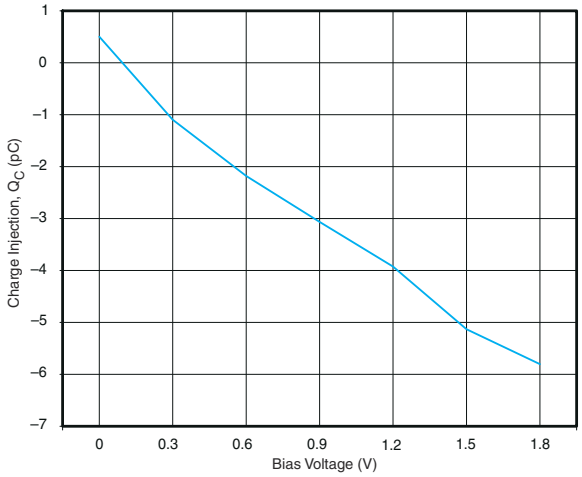

Figure 6-12. Charge Injection vs Bias Voltage (1.8 V)

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6.8 Typical Characteristics (continued)

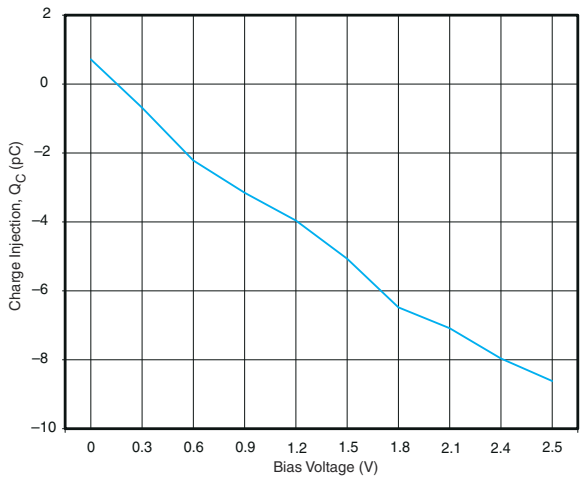

Figure 6-13. Charge Injection vs Bias Voltage (2.5 V)

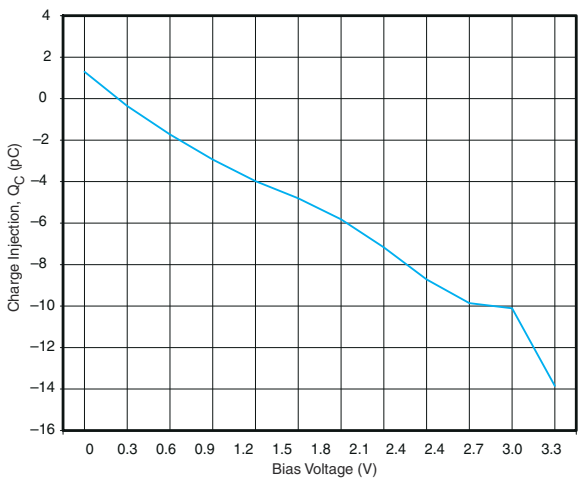

Figure 6-14. Charge Injection vs Bias Voltage (3.3 V)

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7 Parameter Measurement Information

Table 7-1. Parameter Description

	DESCRIPTION
V_{COM}	Voltage at COM.
V_{NC}	Voltage at NC.
V_{NO}	Voltage at NO.
r_{on}	Resistance between COM and NC or NO ports when the channel is ON.
Δr_{on}	Difference of r_{on} between channels in a specific device.
$r_{on(flat)}$	Difference between the maximum and minimum value of r_{on} in a channel over the specified range of conditions.
$I_{NC(OFF)}$	Leakage current measured at the NC port, with the corresponding channel (NC to COM) in the OFF state.
$I_{NC(ON)}$	Leakage current measured at the NC port, with the corresponding channel (NC to COM) in the ON state and the output (COM) open.
$I_{NO(OFF)}$	Leakage current measured at the NO port, with the corresponding channel (NO to COM) in the OFF state.
$I_{NO(ON)}$	Leakage current measured at the NO port, with the corresponding channel (NO to COM) in the ON state and the output (COM) open.
$I_{COM(OFF)}$	Leakage current measured at the COM port, with the corresponding channel (COM to NC or NO) in the OFF state.
$I_{COM(ON)}$	Leakage current measured at the COM port, with the corresponding channel (COM to NC or NO) in the ON state and the output (NC or NO) open.
V_{IH}	Minimum input voltage for logic high for the control input (IN, $\overline{EN}$).
V_{IL}	Maximum input voltage for logic low for the control input (IN, $\overline{EN}$).
V_I	Voltage at the control input (IN, $\overline{EN}$).
I_{IH}, I_{IL}	Leakage current measured at the control input (IN, $\overline{EN}$).
t_{ON}	Turnon time for the switch. This parameter is measured under the specified range of conditions and by the propagation delay between the digital control (IN) signal and analog output (NC or NO) signal when the switch is turning ON.
t_{OFF}	Turnoff time for the switch. This parameter is measured under the specified range of conditions and by the propagation delay between the digital control (IN) signal and analog output (NC or NO) signal when the switch is turning OFF.
Q_C	Charge injection is a measurement of unwanted signal coupling from the control (IN) input to the analog (NC or NO) output. This is measured in coulomb (C) and measured by the total charge induced due to switching of the control input. Charge injection, $Q_C = C_L \times \Delta V_{COM}$, C_L is the load capacitance, and ΔV_{COM} is the change in analog output voltage.
$C_{NC(OFF)}$	Capacitance at the NC port when the corresponding channel (NC to COM) is OFF.
$C_{NC(ON)}$	Capacitance at the NC port when the corresponding channel (NC to COM) is ON.
$C_{NO(OFF)}$	Capacitance at the NC port when the corresponding channel (NO to COM) is OFF.
$C_{NO(ON)}$	Capacitance at the NC port when the corresponding channel (NO to COM) is ON.
$C_{COM(OFF)}$	Capacitance at the COM port when the corresponding channel (COM to NC) is OFF.
$C_{COM(ON)}$	Capacitance at the COM port when the corresponding channel (COM to NC) is ON.
C_I	Capacitance of control input (IN, $\overline{EN}$).
O_{ISO}	OFF isolation of the switch is a measurement of OFF-state switch impedance. This is measured in dB in a specific frequency, with the corresponding channel (NC to COM) in the OFF state.
X_{TALK}	Crosstalk is a measurement of unwanted signal coupling from an ON channel to an OFF channel (NC1 to NO1). Adjacent crosstalk is a measure of unwanted signal coupling from an ON channel to an adjacent ON channel (NC1 to NC2). This is measured in a specific frequency and in dB.
BW	Bandwidth of the switch. This is the frequency in which the gain of an ON channel is –3 dB below the DC gain.
THD	Total harmonic distortion describes the signal distortion caused by the analog switch. This is defined as the ratio of root mean square (RMS) value of the second, third, and higher harmonic to the absolute magnitude of the fundamental harmonic.
I_{CC}	Static power-supply current with the control (IN) pin at V_{CC} or GND.

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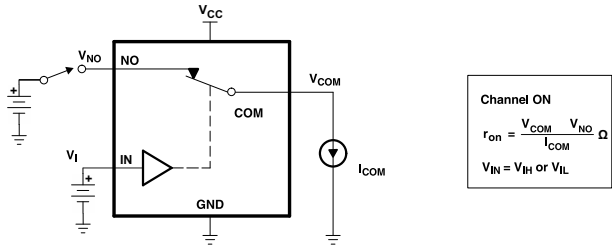


Figure 7-1. ON-State Resistance (r_{ON})

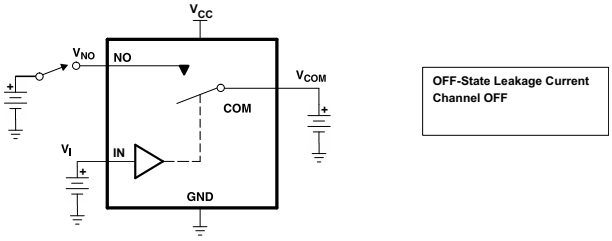


Figure 7-2. OFF-State Leakage Current ($I_{COM(OFF)}$, $I_{NC(OFF)}$, $I_{COM(PWROFF)}$, $I_{NC(PWROFF)}$)

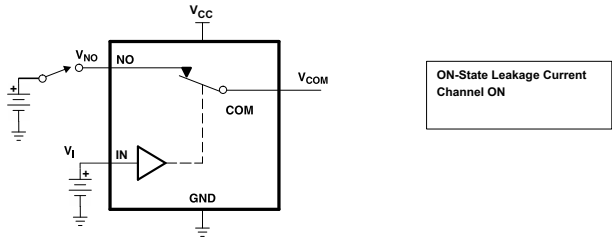


Figure 7-3. ON-State Leakage Current ($I_{COM(ON)}$, $I_{NC(ON)}$)

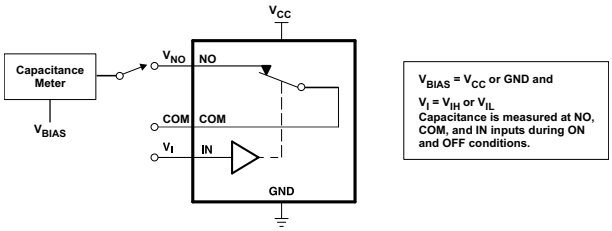
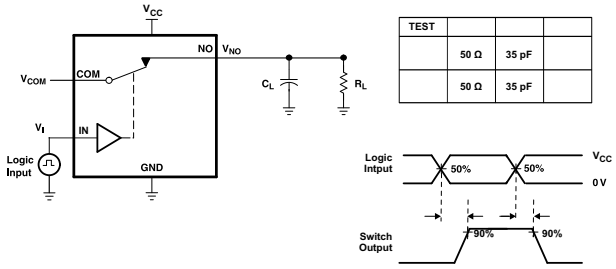
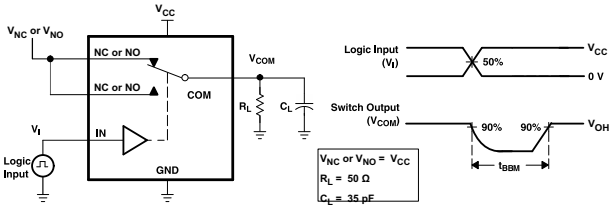


Figure 7-4. Capacitance (C_I, $C_{COM(OFF)}$, $C_{COM(ON)}$, $C_{NC(OFF)}$, $C_{NC(ON)}$)



All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50 Ω, t_r < 5 ns, t_f < 5 ns.
C_L includes probe and jig capacitance.

Figure 7-5. Turnon (t_{ON}) and Turnoff Time (t_{OFF})



C_L includes probe and jig capacitance.
All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50 Ω, t_r < 5 ns, t_f < 5 ns.

Figure 7-6. Break-Before-Make Time (t_{BBM})

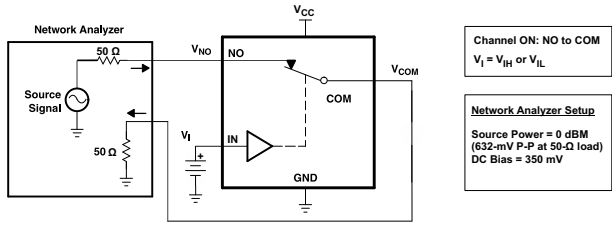


Figure 7-7. Bandwidth (BW)

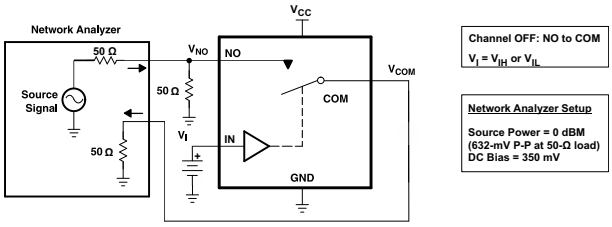


Figure 7-8. OFF Isolation (O_{ISO})

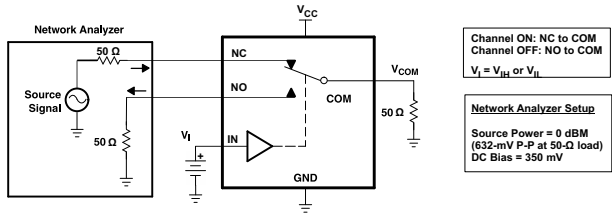
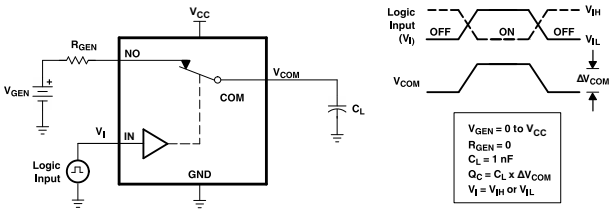


Figure 7-9. Crosstalk (X_{TALK})



All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50 Ω, t_r < 5 ns, t_f < 5 ns.
C_L includes probe and jig capacitance.

Figure 7-10. Charge Injection (Q_C)

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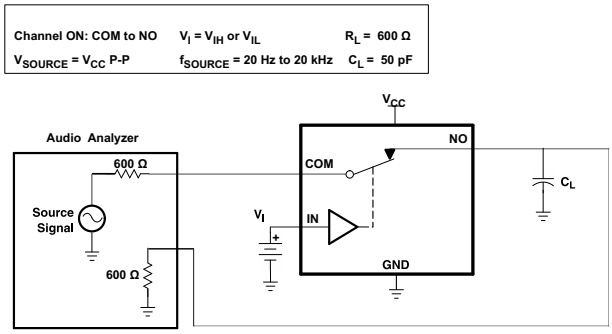


C_L includes probe and jig capacitance.

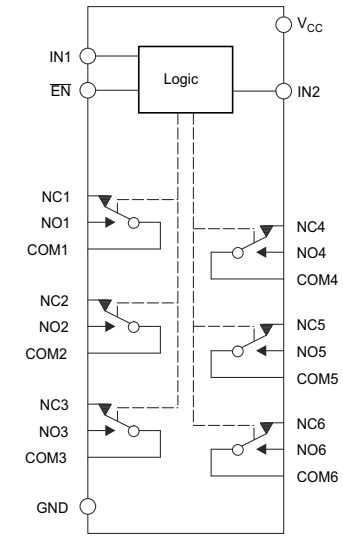
Figure 7-11. Total Harmonic Distortion (THD)

8 Detailed Description

8.1 Overview

The TS3A27518E is a bidirectional, 6-channel, 1:2 multiplexer-demultiplexer designed to operate from 1.65 V to 3.6 V. This device can handle both digital and analog signals, and can transmit signals up to V_{CC} in either direction. The TS3A27518E has two control pins, each controlling three 1:2 muxes at the same time, and an enable pin that puts all outputs in high-impedance mode. The control pins are compatible with 1.8-V logic thresholds and are backward compatible with 2.5-V and 3.3-V logic thresholds.

8.2 Functional Block Diagram



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8.3 Feature Description

The isolation in power-down mode, V_{CC} = 0 feature places all switch paths in high-impedance state (High-Z) when the supply voltage equals 0 V.

8.4 Device Functional Modes

The TS3A27518E is a bidirectional device that has two sets of three single-pole double-throw switches. Two digital signals control the 6 channels of the switch; one digital control for each set of three single-pole, double-throw switches. Digital input pin IN1 controls switches 1, 2, and 3, while pin IN2 controls switches 4, 5, and 6.

The TS3A27518 has an $\overline{EN}$ pin that when set to logic high, it places all channels into a high-impedance or HIGH-Z state. Table 8-1 lists the functions of TS3A27518E.

Table 8-1. Function Table

$\overline{EN}$	IN1	IN2	NC1/2/3 TO COM1/2/3, COM1/2/3 TO NC1/2/3	NC4/5/6 TO COM4/5/6, COM4/5/6 TO NC4/5/6	NO1/2/3 TO COM1/2/3, COM1/2/3 TO NO1/2/3	NO4/5/6 TO COM4/5/6, COM4/5/6 TO NO4/5/6
H	X	X	OFF	OFF	OFF	OFF
L	L	L	ON	ON	OFF	OFF
L	H	L	OFF	ON	ON	OFF
L	L	H	ON	OFF	OFF	ON
L	H	H	OFF	OFF	ON	ON

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9 Application and Implementation

Note

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI's customers are responsible for determining suitability of components for their purposes, as well as validating and testing their design implementation to confirm system functionality.

9.1 Application Information

The switches are bidirectional, so the NO, NC, and COM pins can be used as either inputs or outputs. This functionality allows port expansion to support many different types of bidirectional signal inferfaces such as SD, SDIO, GPIO, MMC, and qSPI.

9.2 Typical Application

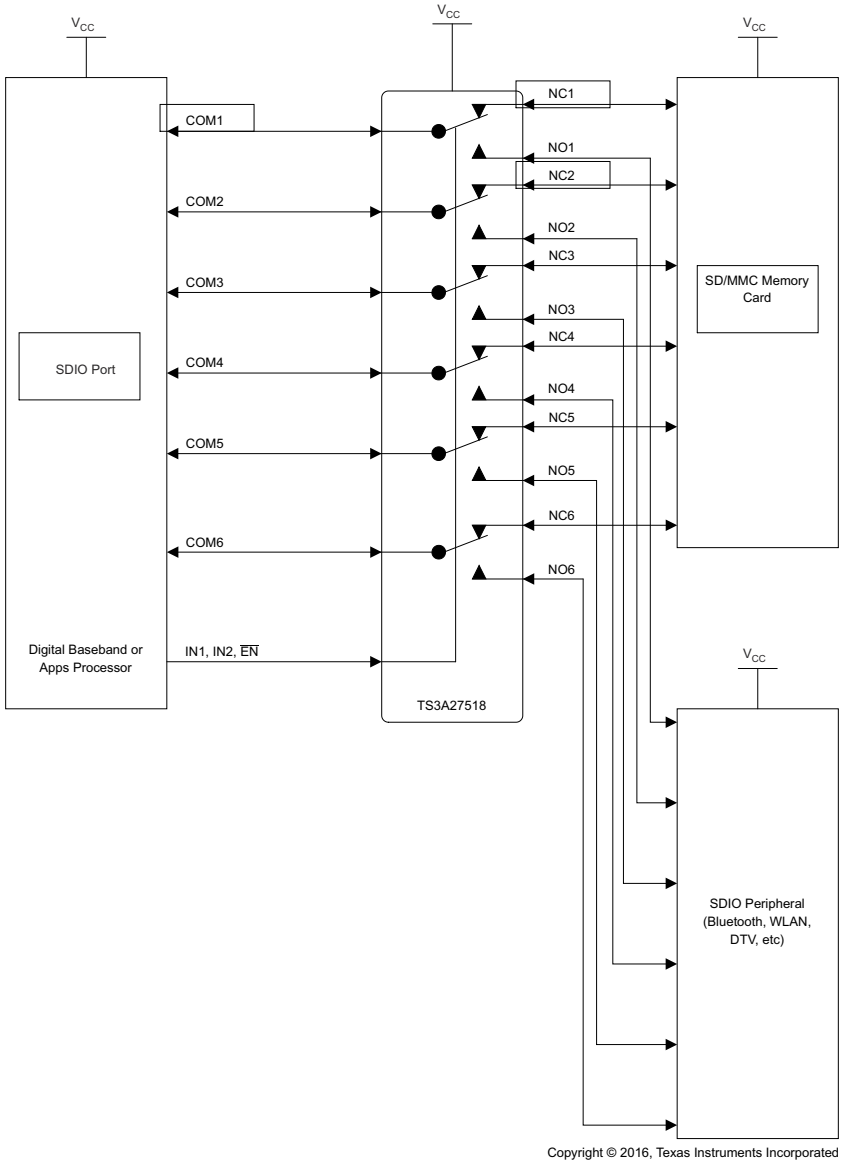

Figure 9-1. SDIO Expander Application Block Diagram

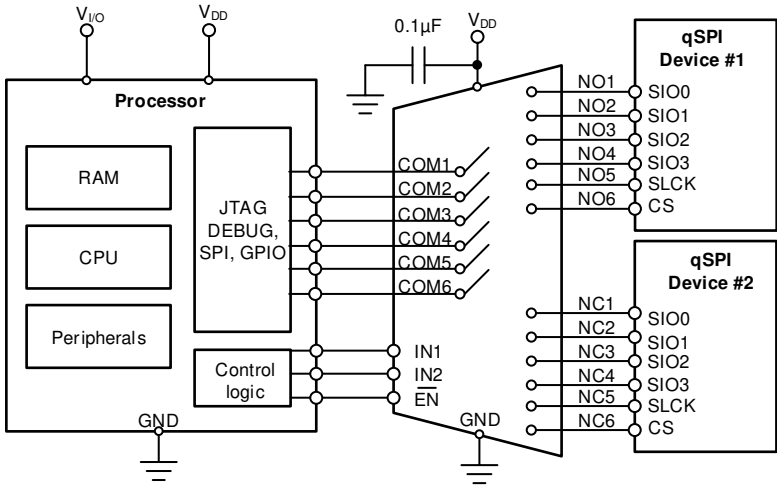

Figure 9-2. qSPI Expander Application Block Diagram

9.2.1 Design Requirement

Ensure that all of the signals passing through the switch are within the recommended operating ranges to ensure proper performance, see *Section 6.3*.

9.2.2 Detailed Design Procedure

The TS3A27518E can be properly operated without any external components. However, TI recommends connecting unused pins to the ground through a 50-Ω resistor to prevent signal reflections back into the device. TI also recommends that the digital control pins (INX) be pulled up to V_{CC} or down to GND to avoid undesired switch positions that could result from the floating pin. Refer to the *Enabling SPI-Based Flash Memory Expansion by Using Multiplexers* application brief for more information on using switches and multiplexers for SPI protocol expansion.

For the RTW package, connect the thermal pad to ground.

9.2.3 Application Curve

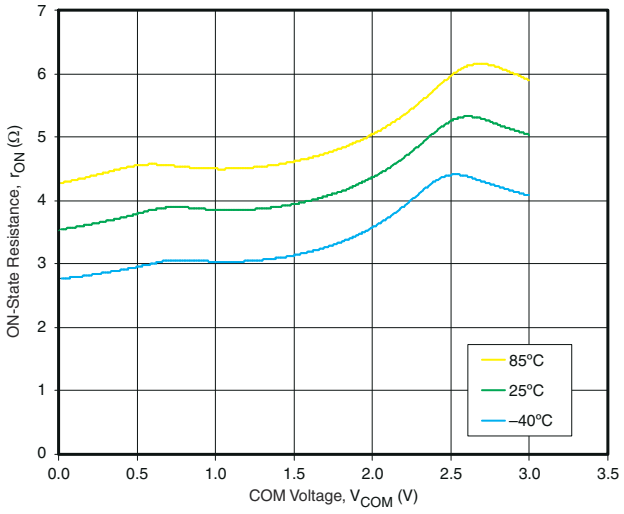

Figure 9-3. ON-State Resistance vs COM Voltage (V_{CC} = 3 V)

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10 Power Supply Recommendations

TI recommends proper power-supply sequencing for all CMOS devices. Do not exceed the absolute maximum ratings, because stresses beyond the listed ratings can cause permanent damage to the device. Always sequence V_{CC} on first, followed by NO, NC, or COM. Although it is not required, power-supply bypassing improves noise margin and prevents switching noise propagation from the V_{CC} supply to other components. A 0.1-µF capacitor is adequate for most applications, if connected from V_{CC} to GND.

11 Layout

11.1 Layout Guidelines

To ensure reliability of the device, TI recommends following these common printed-circuit board layout guidelines:

- Bypass capacitors should be used on power supplies, and should be placed as close as possible to the V_{CC} pin
- Short trace-lengths should be used to avoid excessive loading
- For the RTW package, connect the thermal pad to ground

11.2 Layout Example

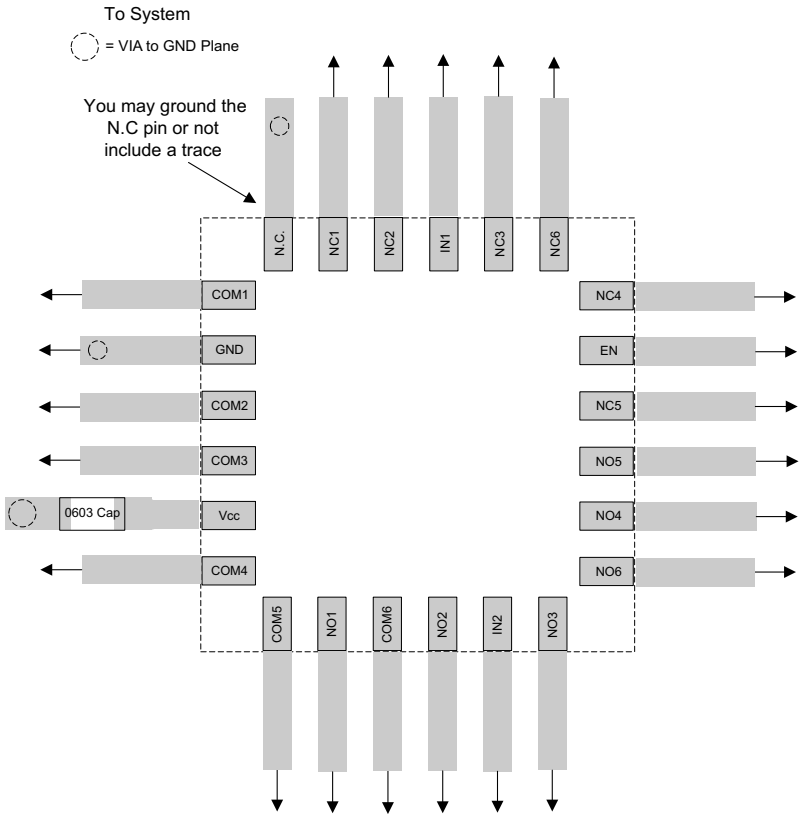

Figure 11-1. WQFN Layout Recommendation

12 Device and Documentation Support

12.1 Documentation Support

12.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, *Enabling SPI-Based Flash Memory Expansion by Using Multiplexers* application brief

12.2 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. Click on *Subscribe to updates* 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.

12.3 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.

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12.4 Trademarks

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All trademarks are the property of their respective owners.

12.5 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.

12.6 Glossary

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

13 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.

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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)
TS3A27518EPWR	Active	Production	TSSOP (PW) | 24	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	YL518E
TS3A27518EPWR.B	Active	Production	TSSOP (PW) | 24	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	YL518E
TS3A27518EPWRG4.B	Active	Production	TSSOP (PW) | 24	2000 | LARGE T&R	Yes	NIPDAU	Level-1-260C-UNLIM	-40 to 85	YL518E
TS3A27518ERTWR	Active	Production	WQFN (RTW) | 24	3000 | LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	YL518E
TS3A27518ERTWR.B	Active	Production	WQFN (RTW) | 24	3000 | LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	YL518E
TS3A27518ERTWRG4.B	Active	Production	WQFN (RTW) | 24	3000 | LARGE T&R	Yes	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	YL518E

(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.

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In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

OTHER QUALIFIED VERSIONS OF TS3A27518E :

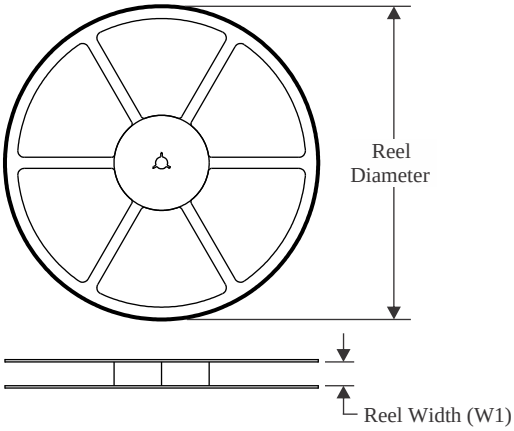
- Automotive : TS3A27518E-Q1

NOTE: Qualified Version Definitions:

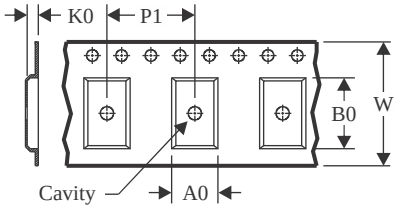
- Automotive - Q100 devices qualified for high-reliability automotive applications targeting zero defects

TAPE AND REEL INFORMATION

REEL DIMENSIONS

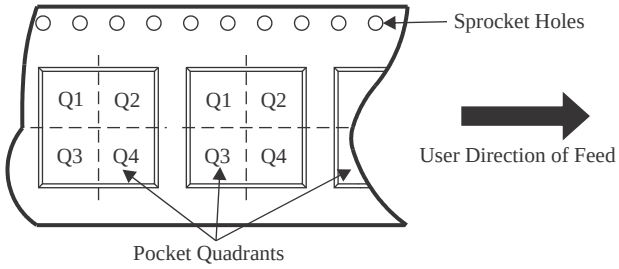


TAPE DIMENSIONS



A0	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

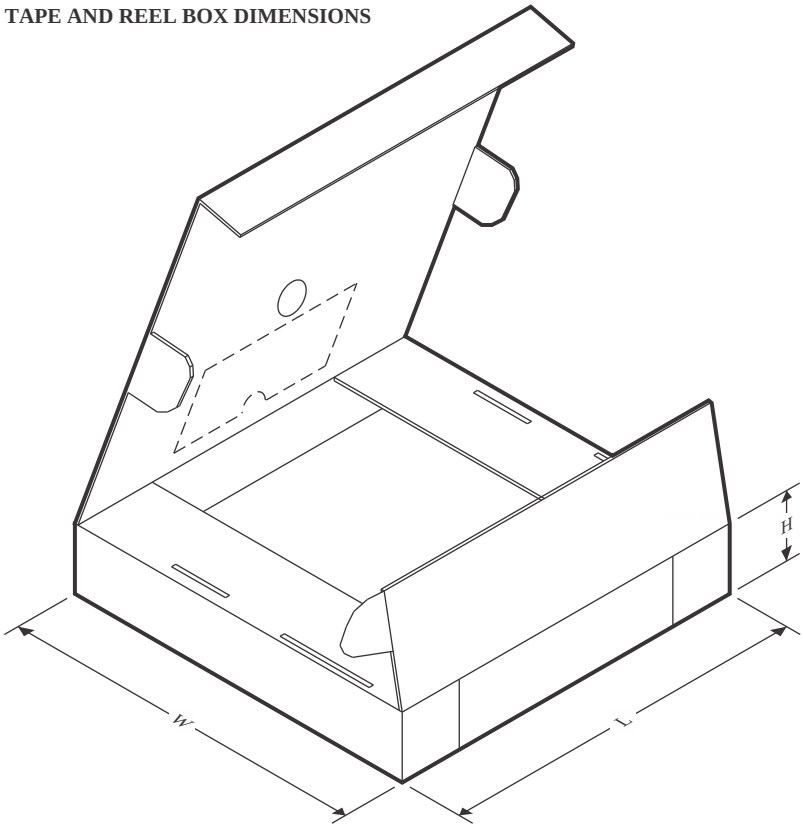
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
TS3A27518EPWR	TSSOP	PW	24	2000	330.0	16.4	6.95	8.3	1.6	8.0	16.0	Q1
TS3A27518ERTWR	WQFN	RTW	24	3000	330.0	12.4	4.25	4.25	1.15	8.0	12.0	Q2

TAPE AND REEL BOX DIMENSIONS



*All dimensions are nominal

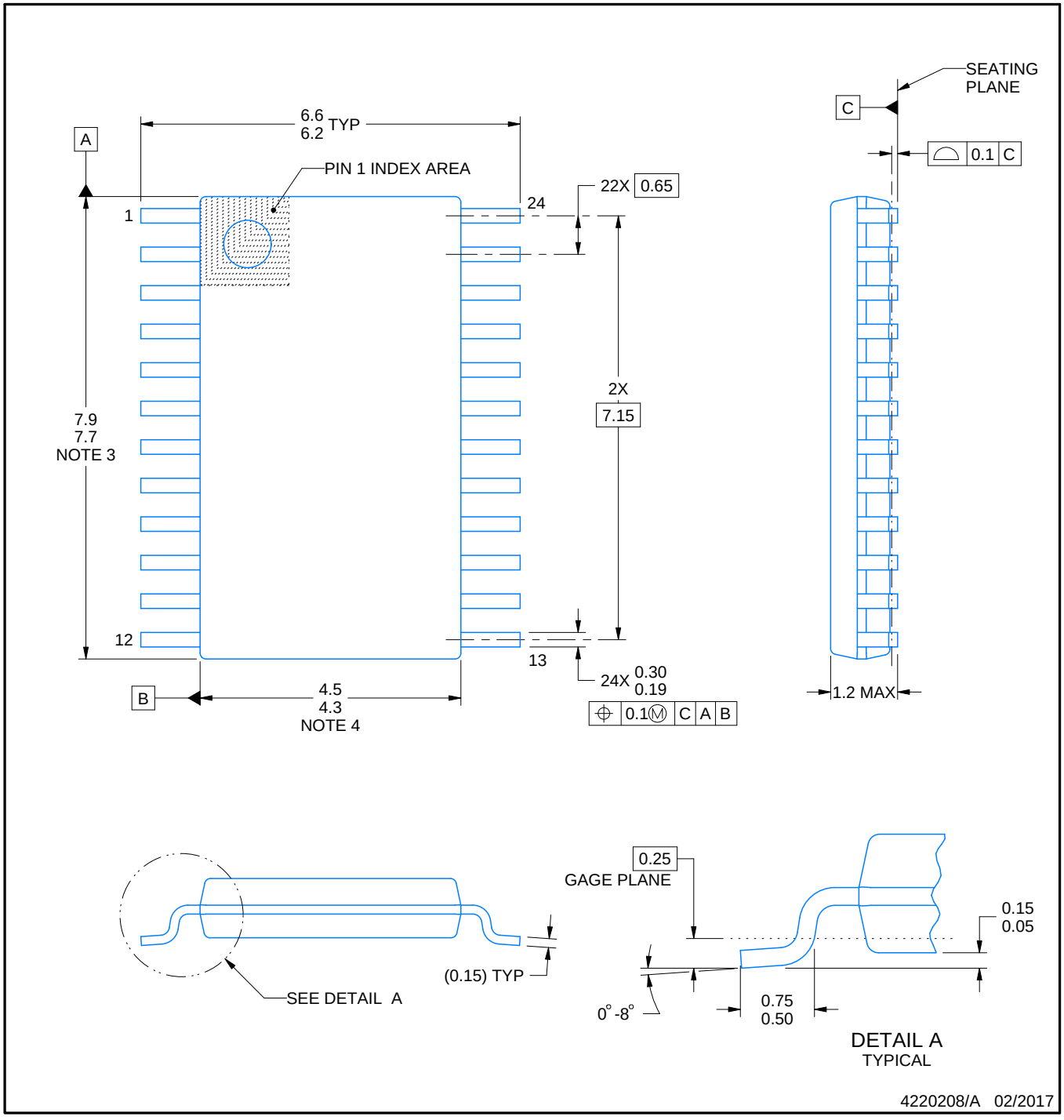
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TS3A27518EPWR	TSSOP	PW	24	2000	356.0	356.0	35.0
TS3A27518ERTWR	WQFN	RTW	24	3000	356.0	356.0	35.0

PACKAGE OUTLINE

PW0024A

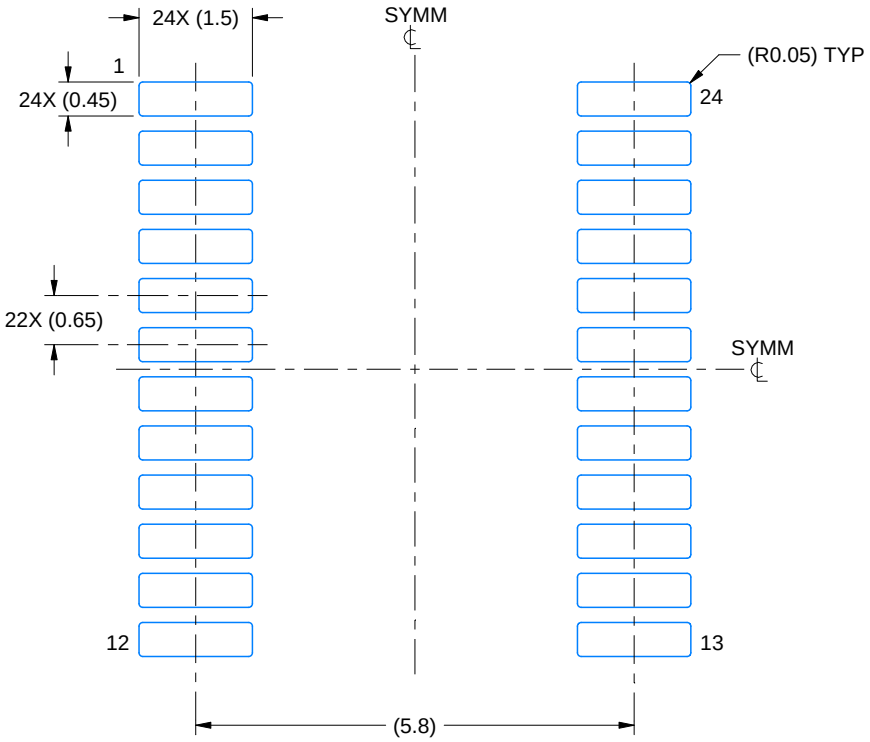
TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE

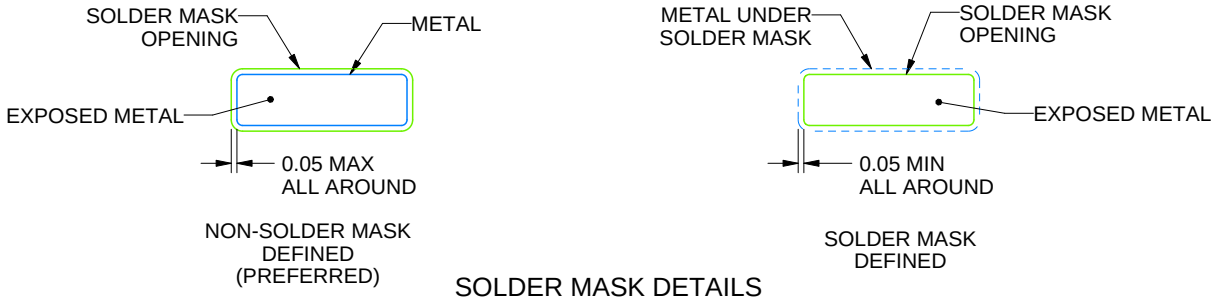


NOTES:

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.
3. This dimension does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.15 mm per side.
4. This dimension does not include interlead flash. Interlead flash shall not exceed 0.25 mm per side.
5. Reference JEDEC registration MO-153.



LAND PATTERN EXAMPLE
EXPOSED METAL SHOWN
SCALE: 10X

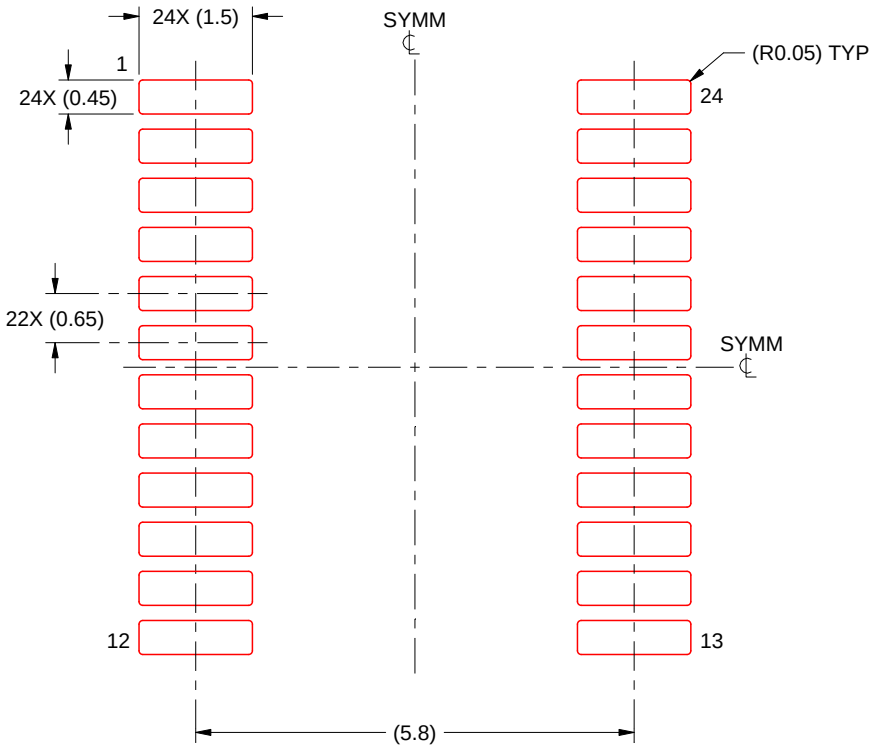


SOLDER MASK DETAILS

4220208/A 02/2017

NOTES: (continued)

6. Publication IPC-7351 may have alternate designs.
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.



SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL
SCALE: 10X

4220208/A 02/2017

NOTES: (continued)

8. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.
9. Board assembly site may have different recommendations for stencil design.

GENERIC PACKAGE VIEW

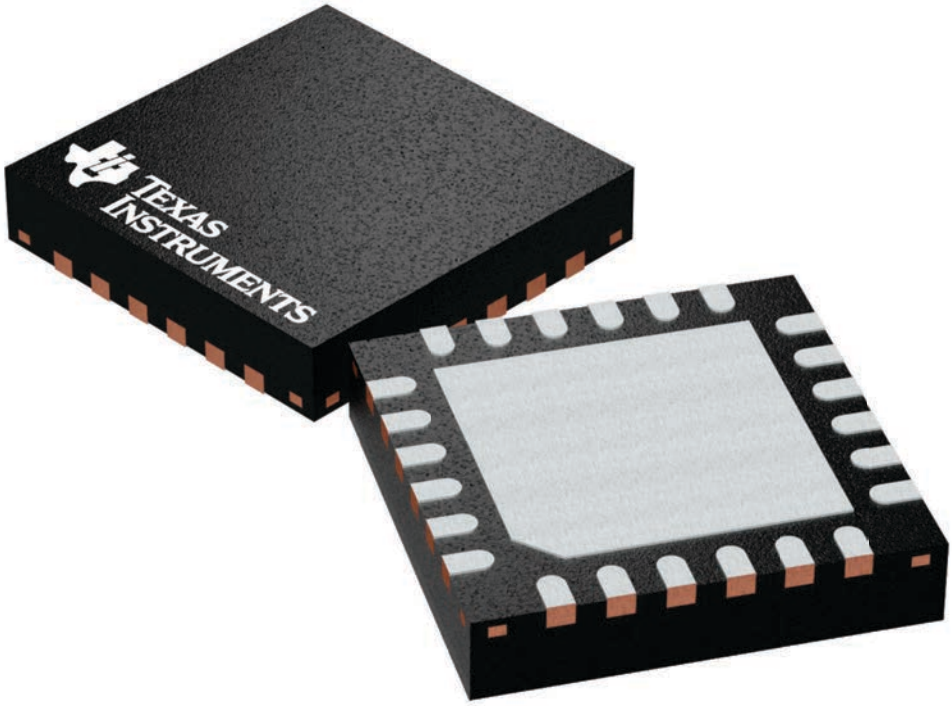
RTW 24

WQFN - 0.8 mm max height

4 x 4, 0.5 mm pitch

PLASTIC 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.



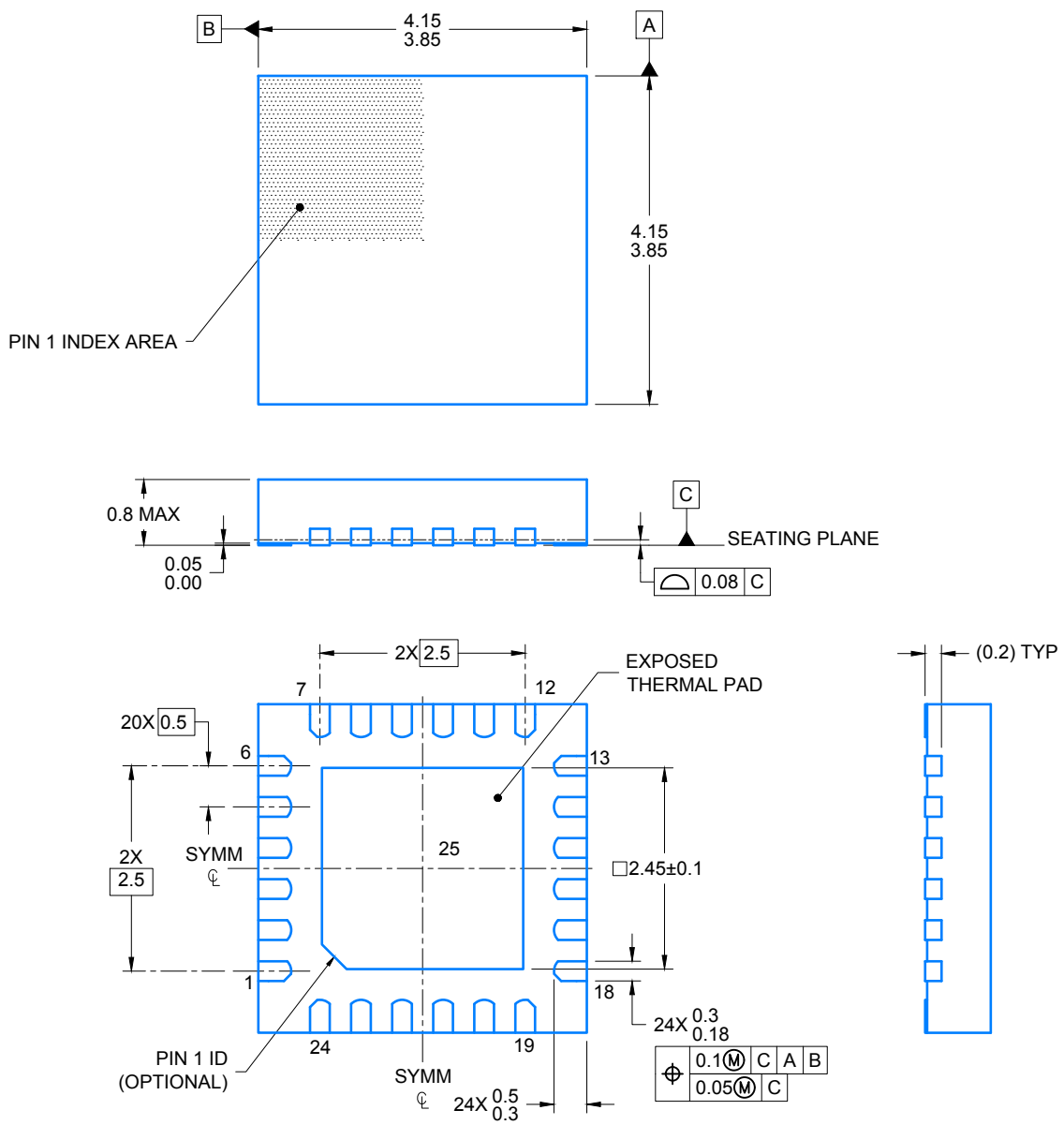
4224801/A

PACKAGE OUTLINE

RTW0024B

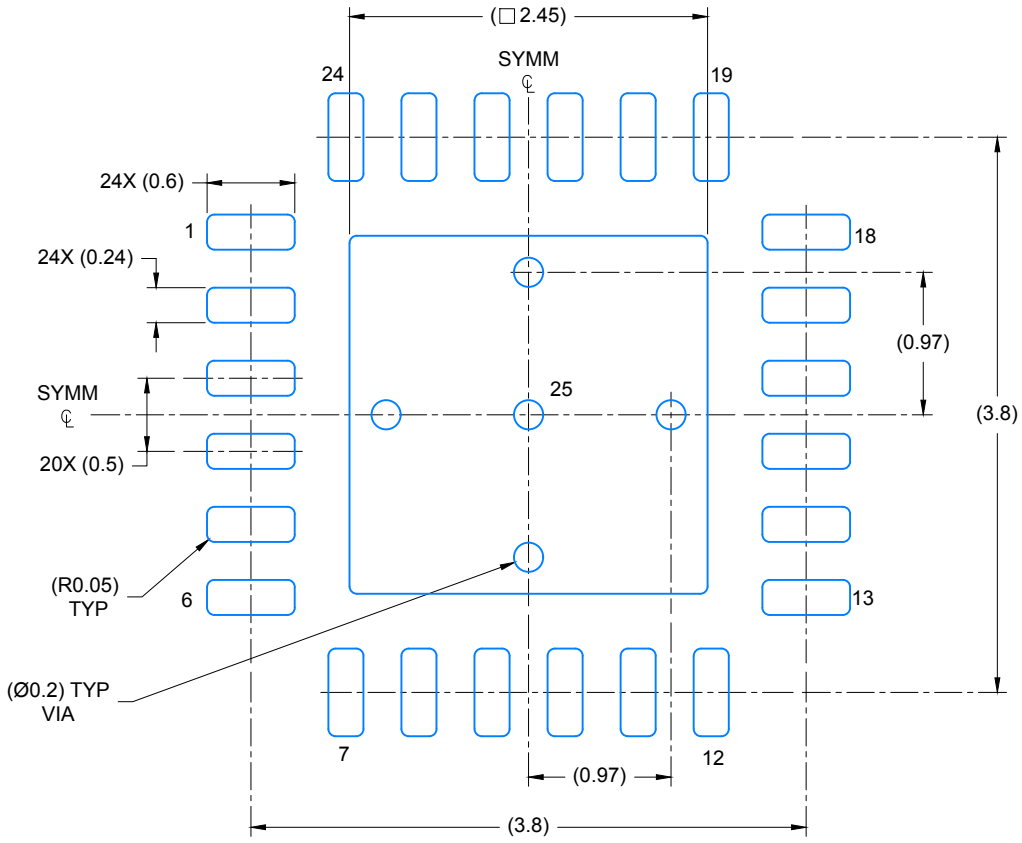
WQFN - 0.8 mm max height

PLASTIC QUAD FLATPACK-NO LEAD

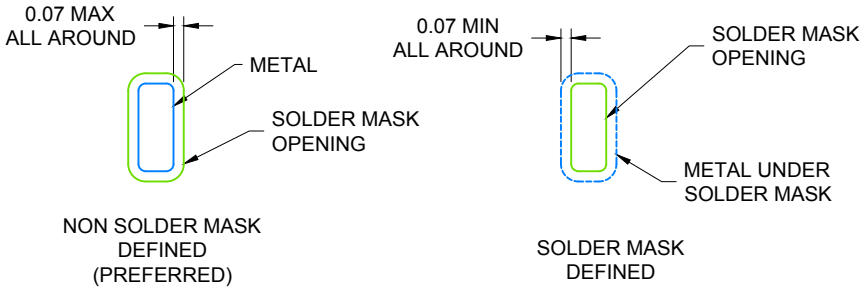


NOTES:

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
SCALE: 20X

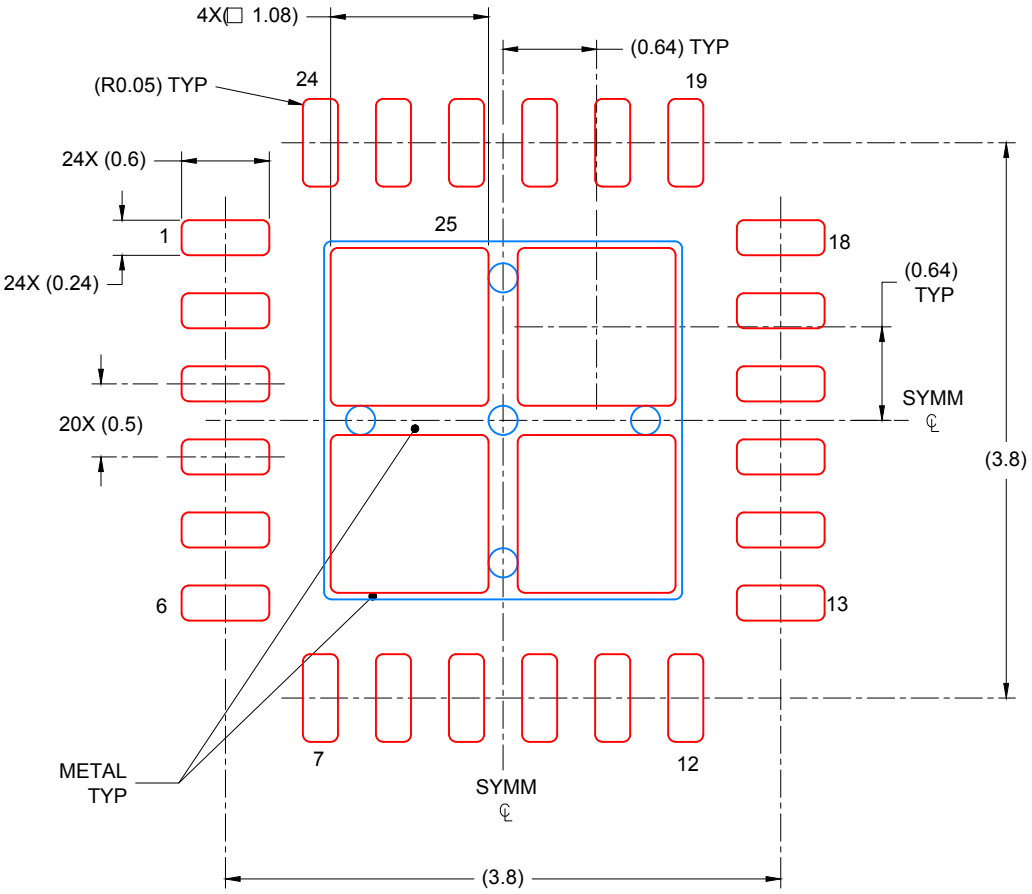


SOLDER MASK DETAILS

4219135/B 11/2016

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

EXPOSED PAD 25:
78% PRINTED COVERAGE BY AREA UNDER PACKAGE
SCALE: 20X

4219135/B 11/2016

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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