

TS3A27518E 6 チャンネル (qSPI)、1:2 マルチプレクサ / デマルチプレクサ、IEC L-4 ESD、1.8V ロジック互換制御入力

1 特長

- 1.65V～3.6V 単一電源動作
- パワーダウン・モード、 $V_{CC} = 0$ のとき絶縁
- 低容量スイッチ、21.5pF (標準値)
- 最大 240MHz の帯域幅により、高速のレール・ツー・レール信号処理に対応
- -62dB のクロストークおよびオフ絶縁
- 1.8V ロジック互換制御入力
- 3.6 V 許容の制御入力
- JESD 78、Class II 準拠で 100mA 超のラッチアップ性能
- JESD 22 準拠で ESD 性能を試験済み
 - 2500V、人体モデル (A114-B、Class II)
 - 1500V、デバイス帯電モデル (C101)
- ESD 性能: NC/NO ポート
 - 接触放電 $\pm 6kV$ (IEC 61000-4-2)
- 24-WQFN (4.00mm × 4.00mm) および 24-TSSOP (7.90mm × 6.60mm) パッケージ

2 アプリケーション

- SD-SDIO および MMC の 2 ポート・マルチプレクサ
- PC VGA ビデオのマルチプレクサ・ビデオ・システム
- オーディオおよびビデオ信号のルーティング

3 概要

TS3A27518E デバイスは、1.65V～3.6V で動作するように設計された、双方向、6 チャンネルの 1:2 マルチプレクサ / デマルチプレクサです。このデバイスはデジタルとアナログの両方の信号を処理でき、 V_{CC} までの信号をどちらの方向にも転送できます。

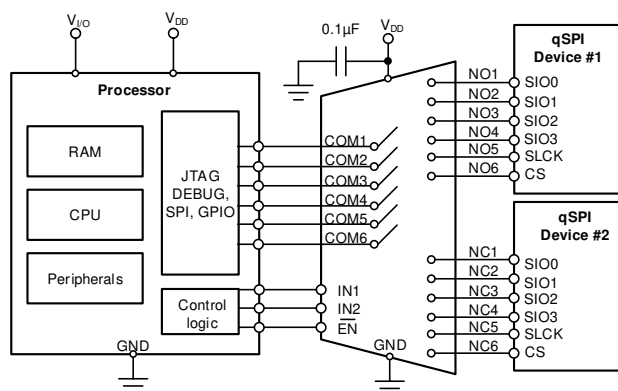
TS3A27518E は 2 つの制御ピンを備えており、それぞれが 3 つの 1:2 マルチプレクサを同時に制御できます。また、すべての出力を高インピーダンス・モードにするイネーブル・ピンを備えています。制御ピンは、1.8V ロジックのスレッシュホールドと互換性があり、2.5V および 3.3V ロジックのスレッシュホールドとも下位互換性があります。

TS3A27518E の SDIO インターフェイスは、6 ビット信号 (CMD、CLK、Data[0:3]) で構成されているため、あらゆる SD、SDIO、マルチメディア・カードのホスト・コントローラを複数のカードまたはペリフェラルに拡張できます。このデバイスは、qSPI など他の 6 ビット・インターフェイスもサポートしています。TS3A27518E には 2 つの制御ピンがあり、ユーザーが柔軟にデバイスを使用できます。たとえば、LCD テレビや LCD モニタ、またはノート PC のドッキング・ステーションなどの機器で、2 つの異なるオーディオ / ビデオ信号を多重化できます。

製品情報⁽¹⁾

部品番号	パッケージ	本体サイズ (公称)
TS3A27518E	WQFN (24)	4.00mm × 4.00mm
	TSSOP (24)	7.90mm × 6.60mm

(1) 利用可能なすべてのパッケージについては、このデータシートの末尾にある注文情報を参照してください。



代表的なアプリケーション



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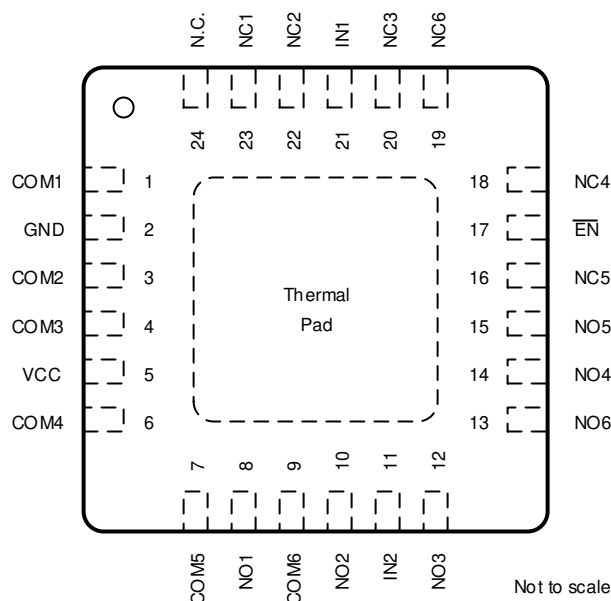
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4 Revision History

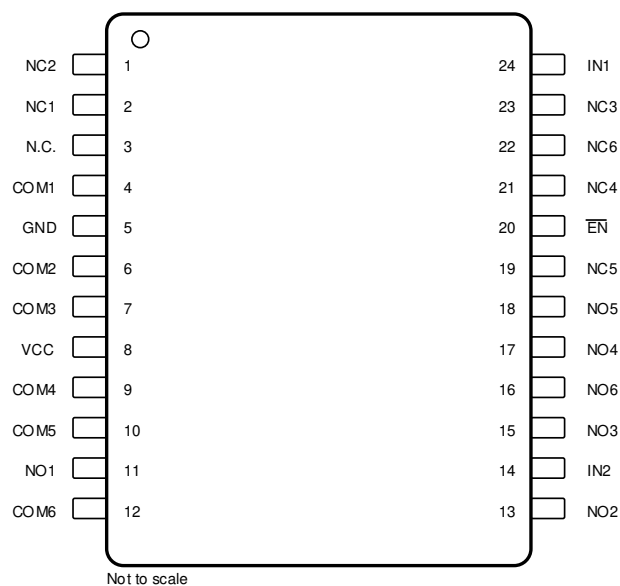
資料番号末尾の英字は改訂を表しています。その改訂履歴は英語版に準じています。

Changes from Revision E (May 2019) to Revision F (December 2021)	Page
• 文書全体にわたって表、図、相互参照の採番方法を更新.....	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
• データシートから BGA MICROSTAR JUNIOR (24) パッケージを削除.....	1
• 「代表的なアプリケーション」を変更.....	1
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• Changed the <i>Pin Configuration</i> images.....	3
• Removed Note: "The input and output voltage ratings..." from the <i>Absolute Maximum Ratings</i> table.....	5
• Removed Note: "This value is limited to 5.5-V maximum" from the <i>Absolute Maximum Ratings</i> table.....	5
• Changed the <i>Application Information</i> section.....	19
• Added 図 9-2	19
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Changes from Revision B (May 2009) to Revision C (December 2015)	Page
• 「ESD 定格」表、「機能説明」セクション、「デバイスの機能モード」セクション、「アプリケーションと実装」セクション、「電源に関する推奨事項」セクション、「レイアウト」セクション、「デバイスおよびドキュメントのサポート」セクション、「メカニカル、パッケージ、および注文情報」セクションを追加。.....	1
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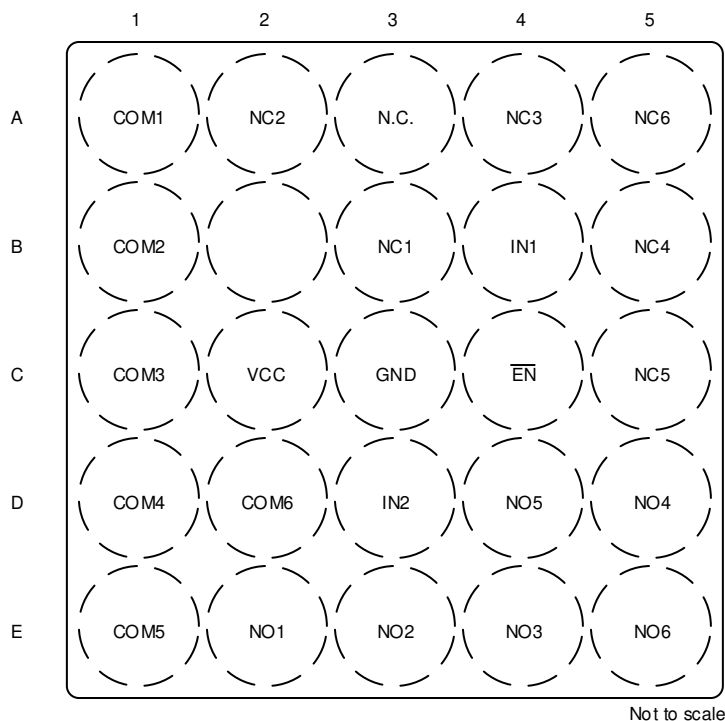
5 Pin Configuration and Functions



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



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



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

表 5-1. Pin Functions

NAME	PIN			I/O	DESCRIPTION
	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
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

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
		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

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

$V_{CC} = 3\text{ V to }3.6\text{ V}$, $T_A = -40^\circ\text{C to }+85^\circ\text{C}$ (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	$V_{CC} = 3\text{ V}$	$0 \leq (V_{NC} \text{ or } V_{NO}) \leq V_{CC},$ $I_{COM} = -32\text{ mA}$	Switch ON, see 7-1	$T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C to }+85^\circ\text{C}$		4.4 7.6	6.2	Ω
Δr_{on}	ON-state resistance match between channels	$V_{CC} = 3\text{ V}$	$V_{NC} \text{ or } V_{NO} = 2.1\text{ V},$ $I_{COM} = -32\text{ mA}$	Switch ON, see 7-1	$T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C to }+85^\circ\text{C}$		0.3 0.8	0.7	Ω
$r_{on(Flat)}$	ON-state resistance flatness	$V_{CC} = 3\text{ V}$	$0 \leq (V_{NC} \text{ or } V_{NO}) \leq V_{CC},$ $I_{COM} = -32\text{ mA}$	Switch ON, see 7-2	$T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C to }+85^\circ\text{C}$		0.95 2.3	2.1	Ω
$I_{NC(OFF)}, I_{NO(OFF)}$	NC, NO OFF leakage current	$V_{CC} = 3.6\text{ V}$	$V_{NC} \text{ or } V_{NO} = 1\text{ V},$ $V_{COM} = 3\text{ V},$ or $V_{NC} \text{ or } V_{NO} = 3\text{ V},$ $V_{COM} = 1\text{ V}$	Switch OFF, see 7-2	$T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C to }+85^\circ\text{C}$	-0.5 -7	0.05	0.5 7	μA
$I_{NC(PWROFF)}, I_{NO(PWROFF)}$		$V_{CC} = 0\text{ V}$	$V_{NC} \text{ or } V_{NO} = 0\text{ to }3.6\text{ V},$ $V_{COM} = 3.6\text{ V to }0,$ or $V_{NC} \text{ or } V_{NO} = 3.6\text{ V to }0,$ $V_{COM} = 0\text{ to }3.6\text{ V}$		$T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C to }+85^\circ\text{C}$	-1 -12	0.05	1 12	
$I_{COM(OFF)}$	COM OFF leakage current	$V_{CC} = 3.6\text{ V}$	$V_{NC} \text{ or } V_{NO} = 3\text{ V},$ $V_{COM} = 1\text{ V},$ or $V_{NC} \text{ or } V_{NO} = 1\text{ V},$ $V_{COM} = 3\text{ V}$	Switch OFF, see 7-2	$T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C to }+85^\circ\text{C}$	-1 -2	0.01	1 2	μA
$I_{COM(PWROFF)}$		$V_{CC} = 0\text{ V}$	$V_{NC} \text{ or } V_{NO} = 3.6\text{ V to }0,$ $V_{COM} = 0\text{ to }3.6\text{ V},$ or $V_{NC} \text{ or } V_{NO} = 0\text{ to }3.6\text{ V},$ $V_{COM} = 3.6\text{ V to }0$		$T_A = 25^\circ\text{C}$ $T_A = -40^\circ\text{C to }+85^\circ\text{C}$	-1 -12	0.02	1 1	

6.5 Electrical Characteristics for 3.3-V Supply (continued)

$V_{CC} = 3\text{ V to }3.6\text{ V}$, $T_A = -40^\circ\text{C to }+85^\circ\text{C}$ (unless otherwise noted)

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

6.5 Electrical Characteristics for 3.3-V Supply (continued)

$V_{CC} = 3\text{ V to }3.6\text{ V}$, $T_A = -40^\circ\text{C to }+85^\circ\text{C}$ (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

$V_{CC} = 2.3\text{ V to }2.7\text{ V}$, $T_A = -40^\circ\text{C to }+85^\circ\text{C}$ (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 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 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 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 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 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 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 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, 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		

6.6 Electrical Characteristics for 2.5-V Supply (continued)

$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$, $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ (unless otherwise noted)

PARAMETER		TEST CONDITIONS				MIN	TYP	MAX	UNIT
DYNAMIC									
t _{ON}	Turnon time	V _{CC} = 2.5 V	V _{COM} = V _{CC} , R _L = 50 Ω	C _L = 35 pF, see 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} = V _{CC} , R _L = 50 Ω	C _L = 35 pF, see 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 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 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 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 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 7-4		22			pF
C _{COM(ON)}	COM ON capacitance	V _{CC} = 2.5 V	V _{COM} = V _{CC} or GND, switch ON	See 7-4		22			pF
C _I	Digital input capacitance	V _{CC} = 2.5 V	V _I = V _{CC} or GND	See 7-4		2			pF
BW	Bandwidth	V _{CC} = 2.5 V	R _L = 50 Ω	Switch ON, see 7-6		240			MHz
O _{ISO}	OFF isolation	V _{CC} = 2.5 V	R _L = 50 Ω, f = 10 MHz	Switch OFF, see 7-8		−62			dB
X _{TALK}	Crosstalk	V _{CC} = 2.5 V	R _L = 50 Ω, f = 10 MHz	Switch ON, see 7-9		−62			dB
X _{TALK(ADJ)}	Crosstalk adjacent	V _{CC} = 2.5 V	R _L = 50 Ω, f = 10 MHz	Switch ON, see 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 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

$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$, $T_A = -40^\circ\text{C to } 85^\circ\text{C}$ (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	$V_{CC} = 1.65 \text{ V}$	$0 \leq (V_{NC} \text{ or } V_{NO}) \leq V_{CC}$, $I_{COM} = -32 \text{ mA}$	Switch ON, see 7-1	$T_A = 25^\circ\text{C}$		7.1	14.4	Ω
					$T_A = -40^\circ\text{C to } +85^\circ\text{C}$			16.3	

6.7 Electrical Characteristics for 1.8-V Supply (continued)

$V_{CC} = 1.65 \text{ V}$ to 1.95 V , $T_A = -40^\circ\text{C}$ to 85°C (unless otherwise noted)

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

6.7 Electrical Characteristics for 1.8-V Supply (continued)

 $V_{CC} = 1.65\text{ V to }1.95\text{ V}$, $T_A = -40^\circ\text{C to }85^\circ\text{C}$ (unless otherwise noted)

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

6.8 Typical Characteristics

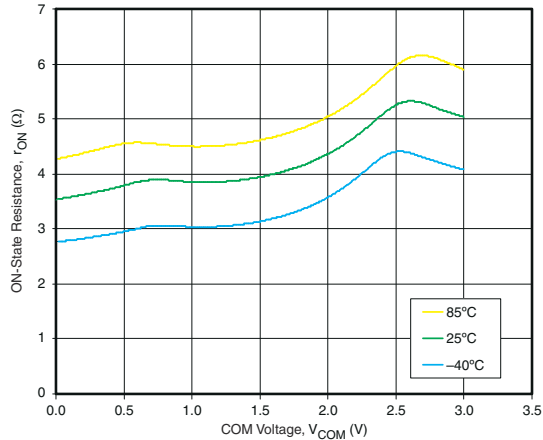


FIG 6-1. ON-State Resistance vs COM Voltage ($V_{CC} = 3\text{ V}$)

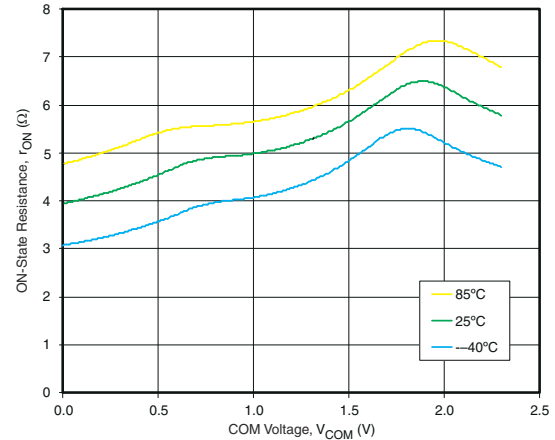


FIG 6-2. ON-State Resistance vs COM Voltage ($V_{CC} = 2.3\text{ V}$)

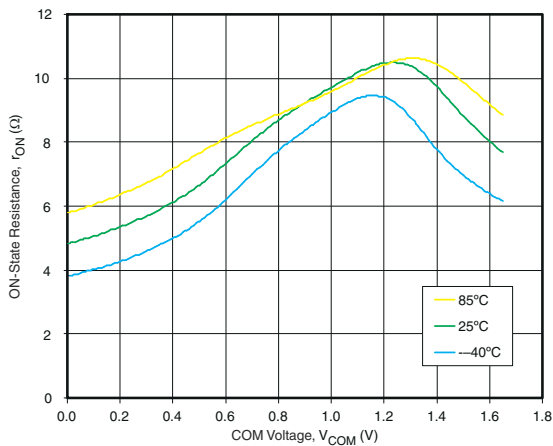


FIG 6-3. ON-State Resistance vs COM Voltage ($V_{CC} = 1.65\text{ V}$)

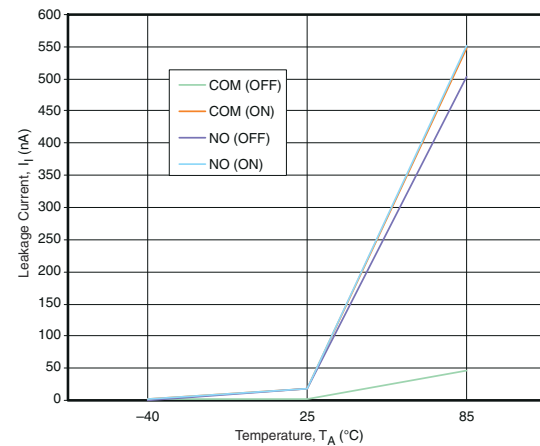


FIG 6-4. Leakage Current vs Temperature ($V_{CC} = 3.3\text{ V}$)

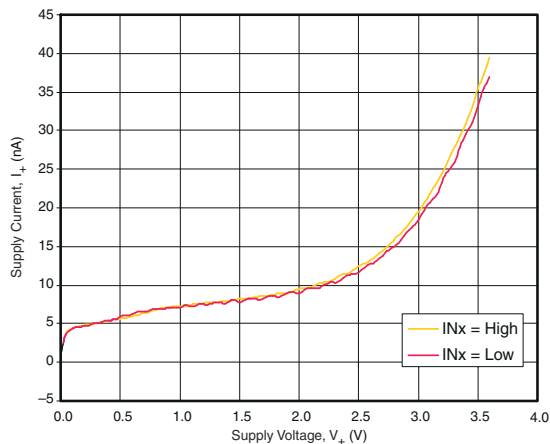


FIG 6-5. Supply Current vs Supply Voltage

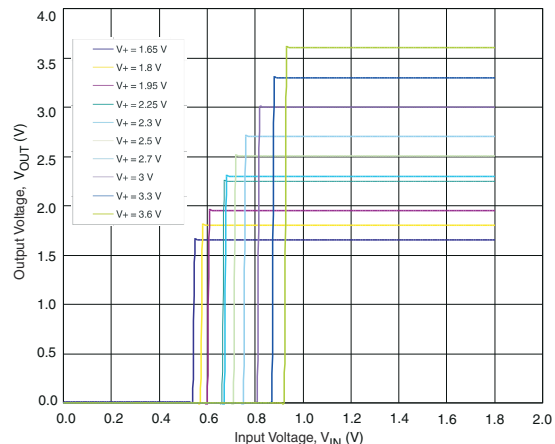
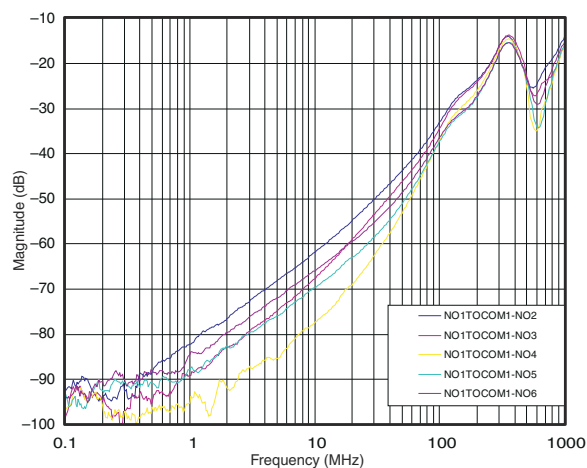
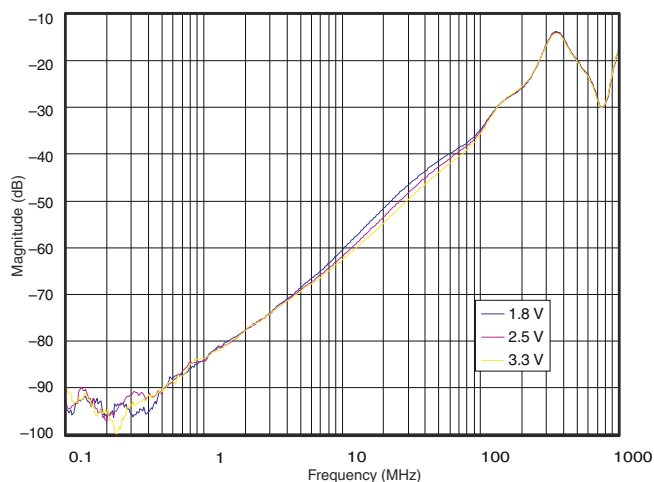


FIG 6-6. Control Input Thresholds ($IN1$, $T_A = 25^\circ\text{C}$)

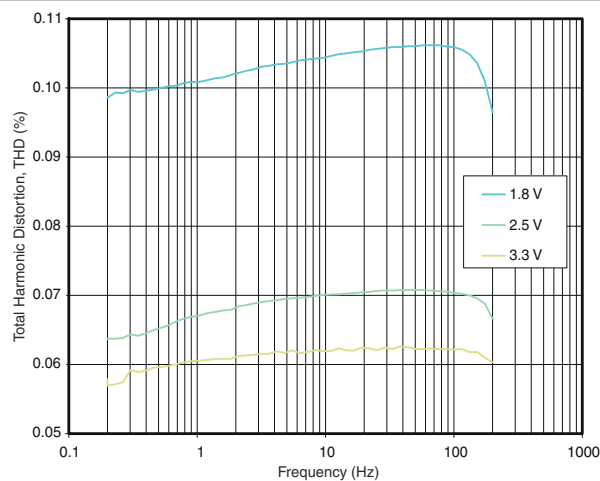
6.8 Typical Characteristics (continued)



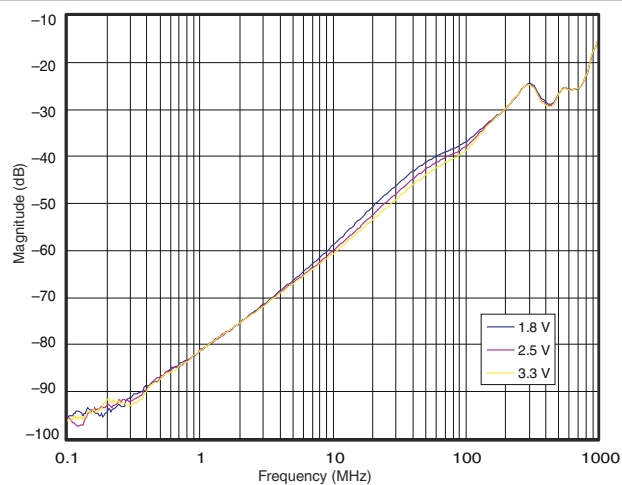
6-7. Crosstalk Adjacent



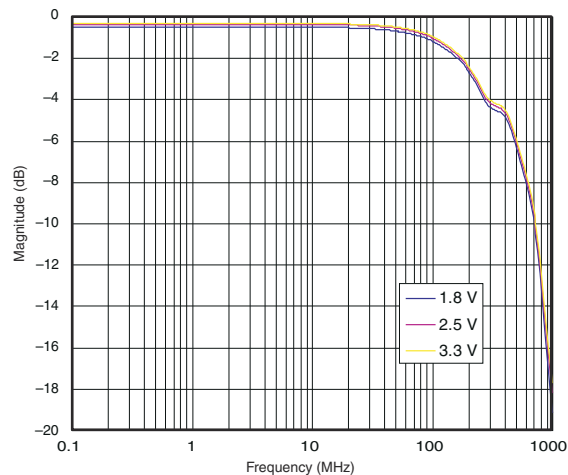
6-8. Crosstalk



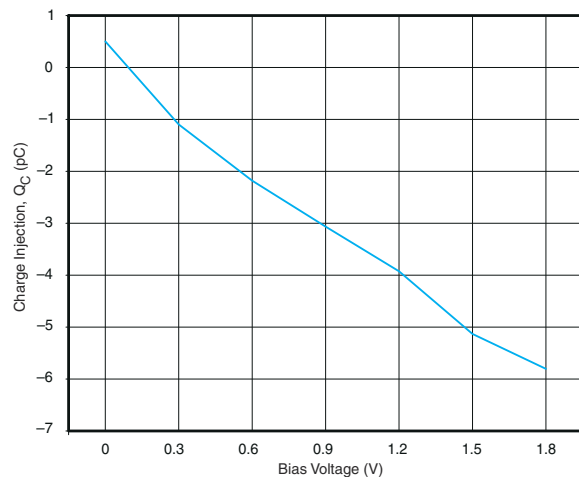
6-9. Total Harmonic Distortion vs Frequency



6-10. OFF Isolation



6-11. Insertion Loss



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

6.8 Typical Characteristics (continued)

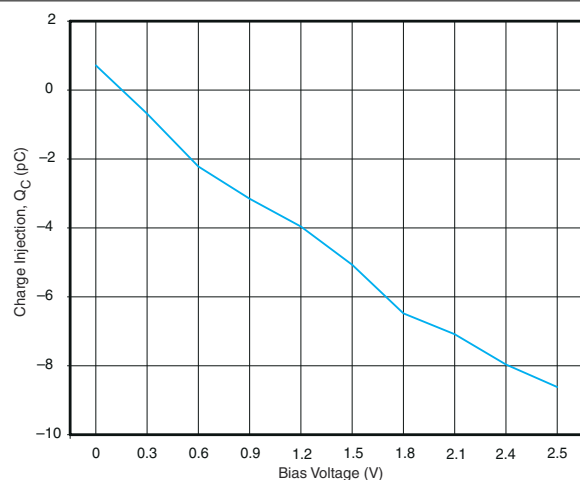


FIG 6-13. Charge Injection vs Bias Voltage (2.5 V)

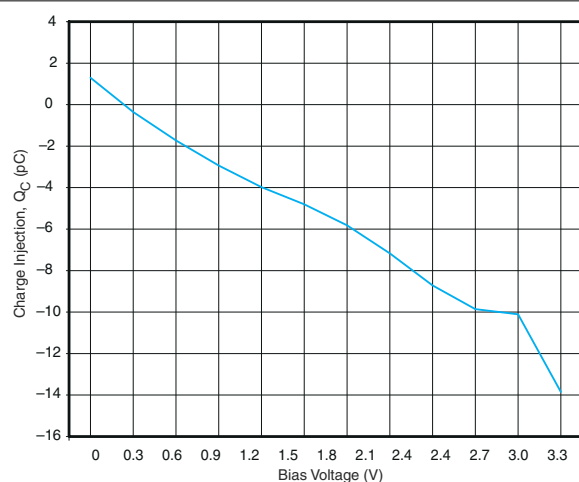
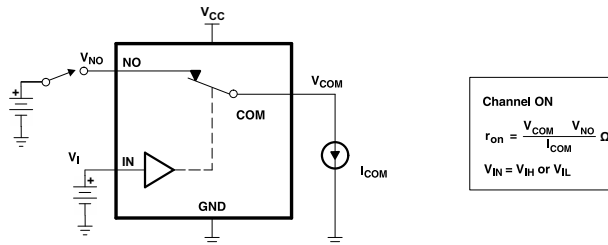
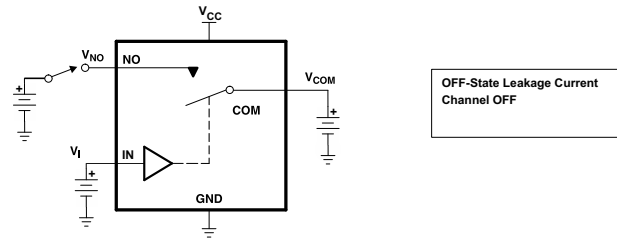
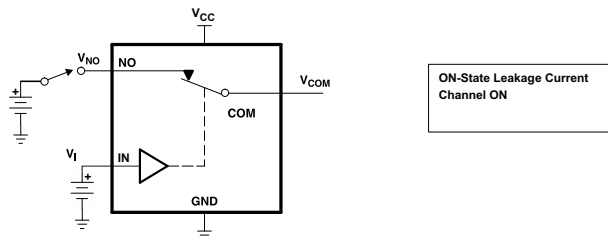
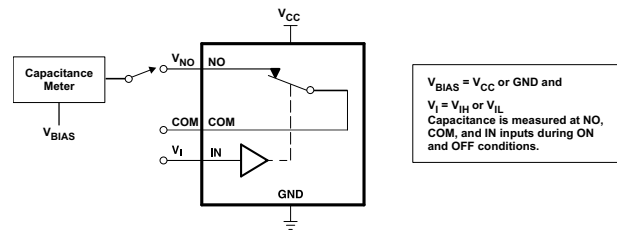
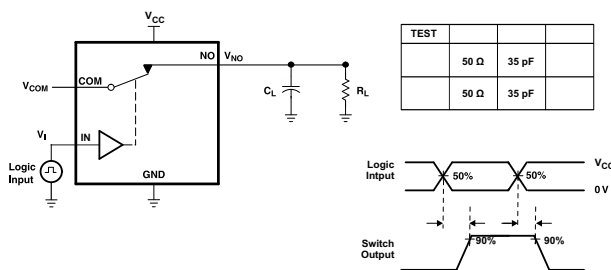


FIG 6-14. Charge Injection vs Bias Voltage (3.3 V)

7 Parameter Measurement Information

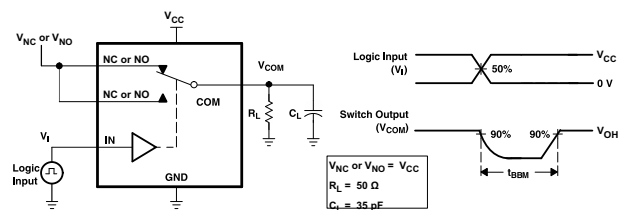
表 7-1. Parameter Description

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.


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

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

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

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


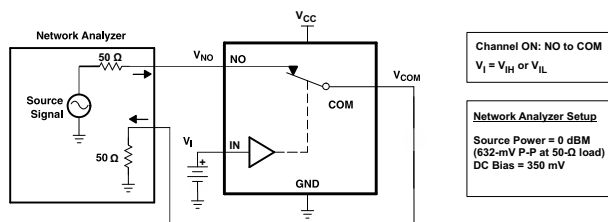
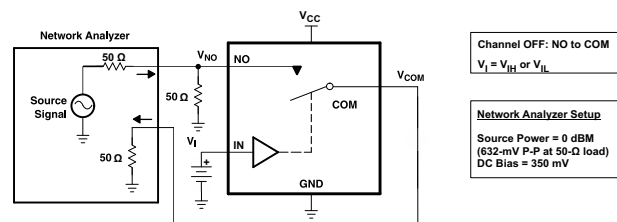
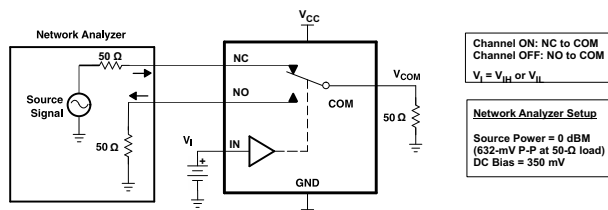
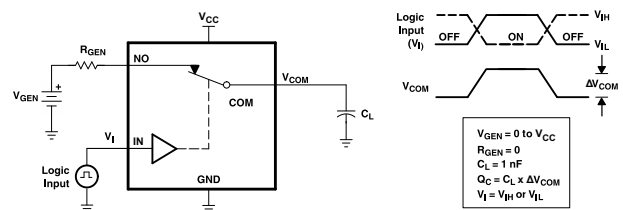
All input pulses are supplied by generators having the following characteristics: PRR $\leq$ 10 MHz, $Z_0 = 50 \Omega$, $t_r < 5$ ns, $t_f < 5$ ns.

C_L includes probe and jig capacitance.

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


C_L includes probe and jig capacitance.

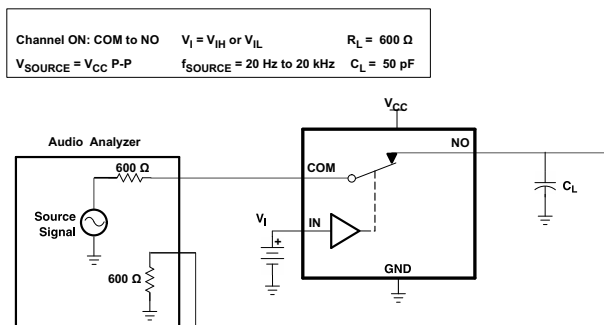
All input pulses are supplied by generators having the following characteristics: PRR $\leq$ 10 MHz, $Z_0 = 50 \Omega$, $t_r < 5$ ns, $t_f < 5$ ns.

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

FIG 7-7. Bandwidth (BW)

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

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


All input pulses are supplied by generators having the following characteristics: PRR $\leq$ 10 MHz, $Z_0 = 50 \Omega$, $t_r < 5$ ns, $t_f < 5$ ns.

C_L includes probe and jig capacitance.

FIG 7-10. Charge Injection (Q_C)



C_L includes probe and jig capacitance.

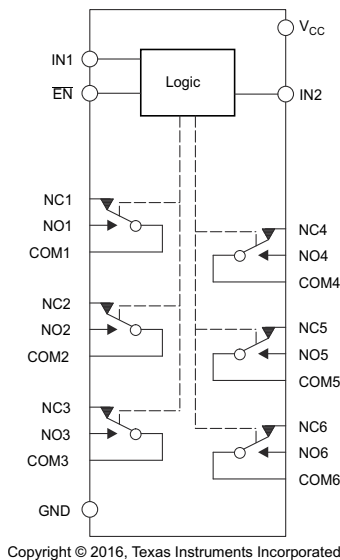
7-11. Total Harmonic Distortion (THD)

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



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. 表 8-1 lists the functions of TS3A27518E.

表 8-1. Function Table

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

9 Application and Implementation

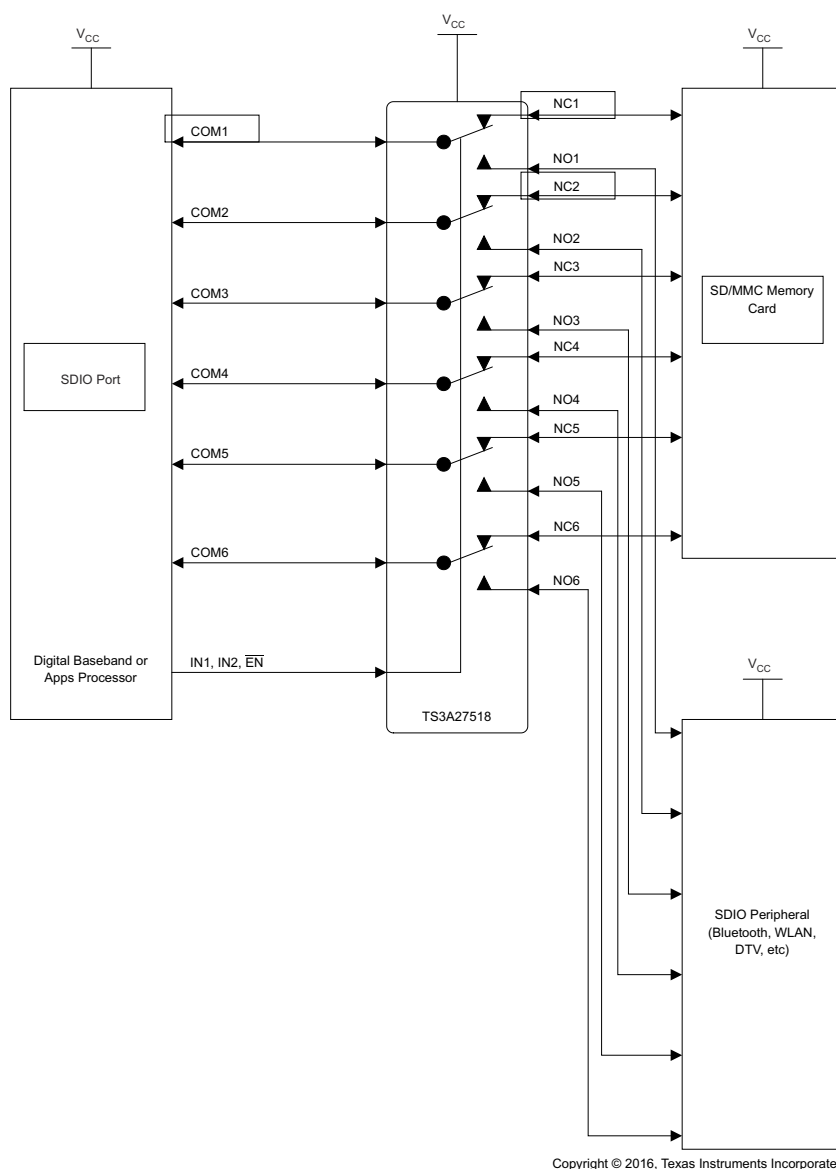
Note

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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 interfaces such as SD, SDIO, GPIO, MMC, and qSPI.

9.2 Typical Application



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図 9-1. SDIO Expander Application Block Diagram

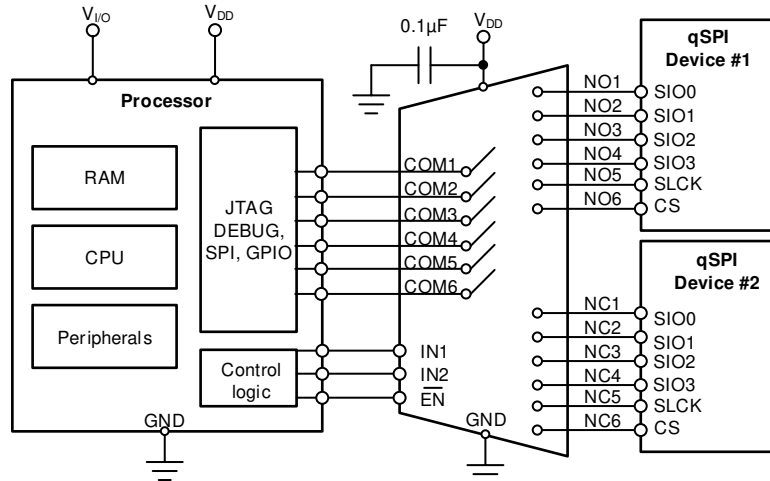


图 9-2. qSPI Expander Application Block Diagram

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 [セクション 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

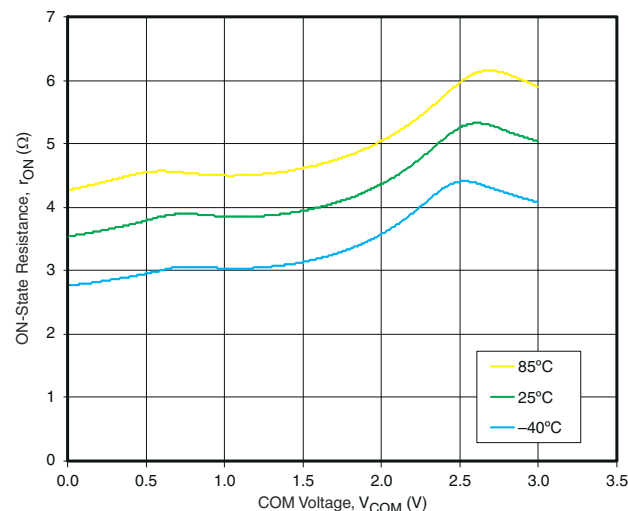


图 9-3. ON-State Resistance vs COM Voltage ($V_{CC} = 3\text{ V}$)

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- μ F capacitor is adequate for most applications, if connected from V_{CC} to GND.

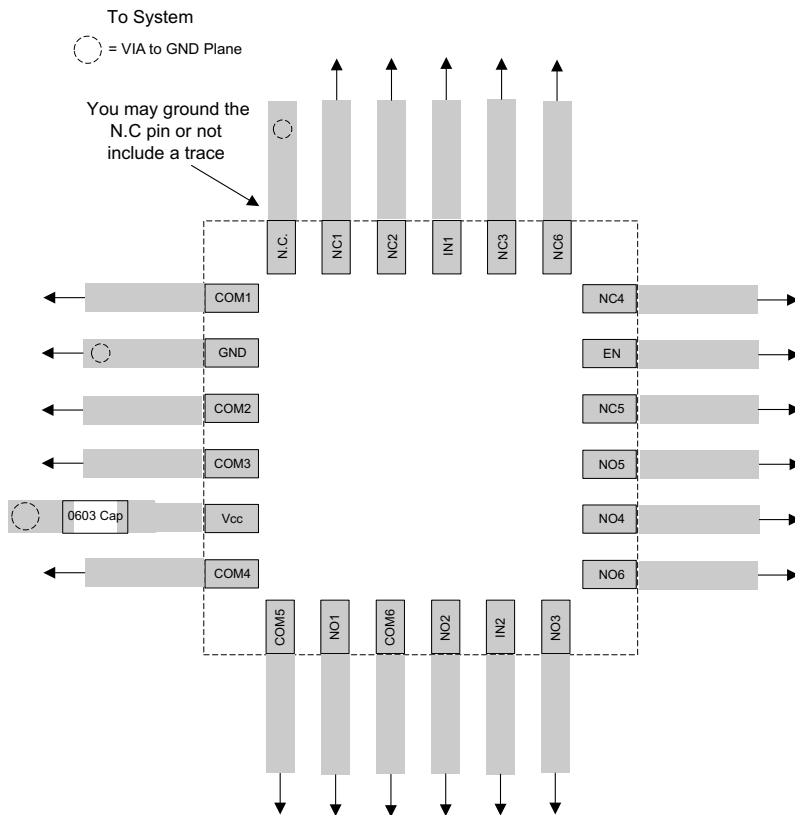
11 Layout

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



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 サポート・リソース

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12.4 Trademarks

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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.

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	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	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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OTHER QUALIFIED VERSIONS OF TS3A27518E :

- Automotive : [TS3A27518E-Q1](#)

NOTE: Qualified Version Definitions:

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

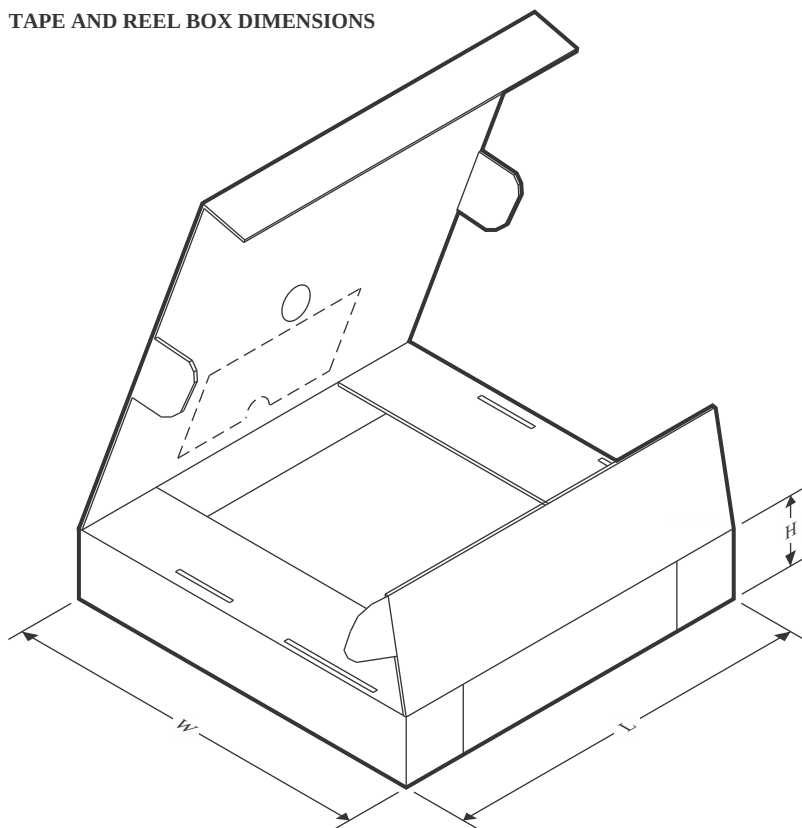
TAPE AND REEL INFORMATION



*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
TS3A27518EPWRG4	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
TS3A27518ERTWRG4	WQFN	RTW	24	3000	330.0	12.4	4.25	4.25	1.15	8.0	12.0	Q2

TAPE AND REEL BOX DIMENSIONS

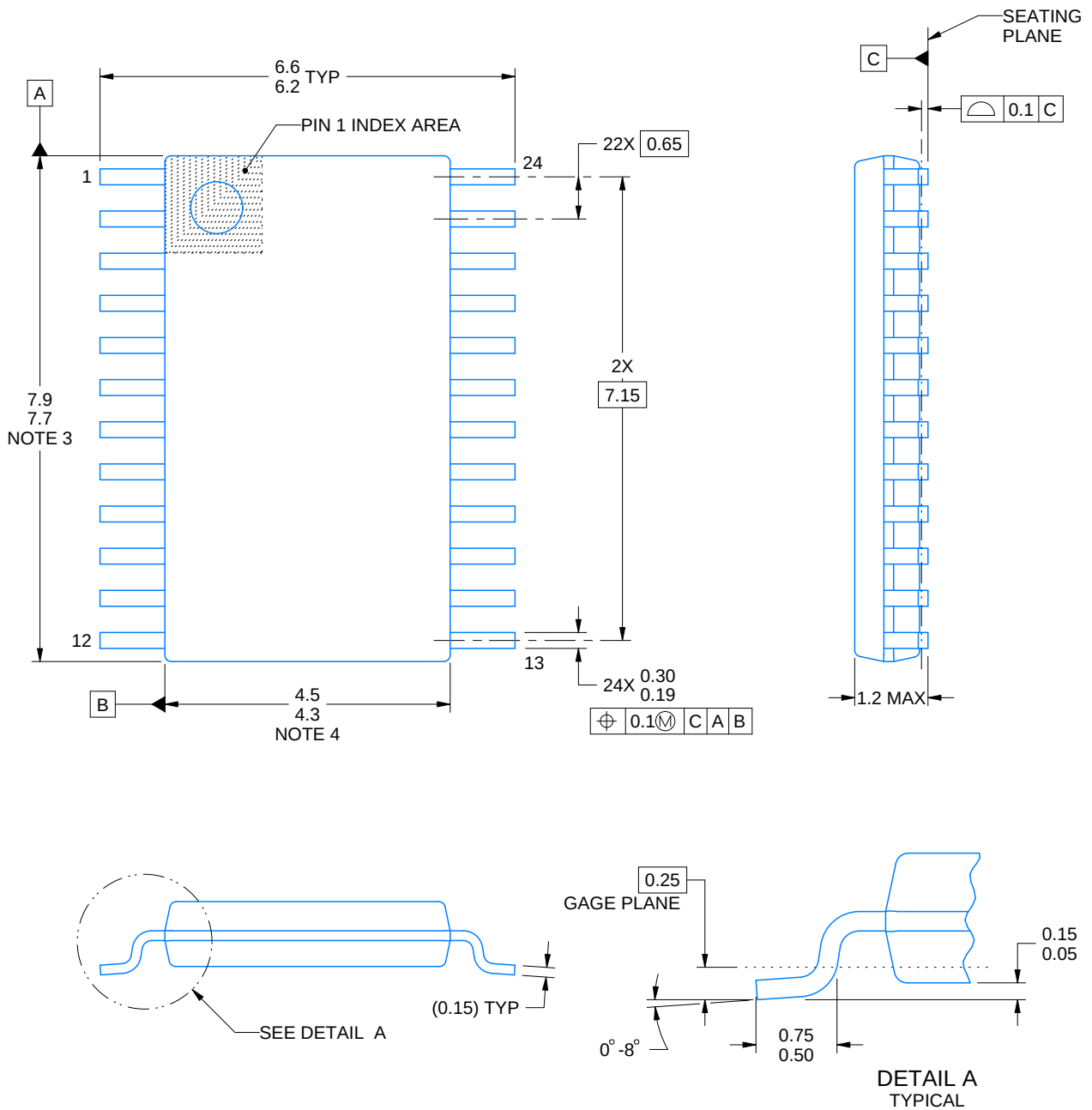


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TS3A27518EPWR	TSSOP	PW	24	2000	353.0	353.0	32.0
TS3A27518EPWRG4	TSSOP	PW	24	2000	353.0	353.0	32.0
TS3A27518ERTWR	WQFN	RTW	24	3000	353.0	353.0	32.0
TS3A27518ERTWRG4	WQFN	RTW	24	3000	353.0	353.0	32.0



TSSOP - 1.2 mm max height

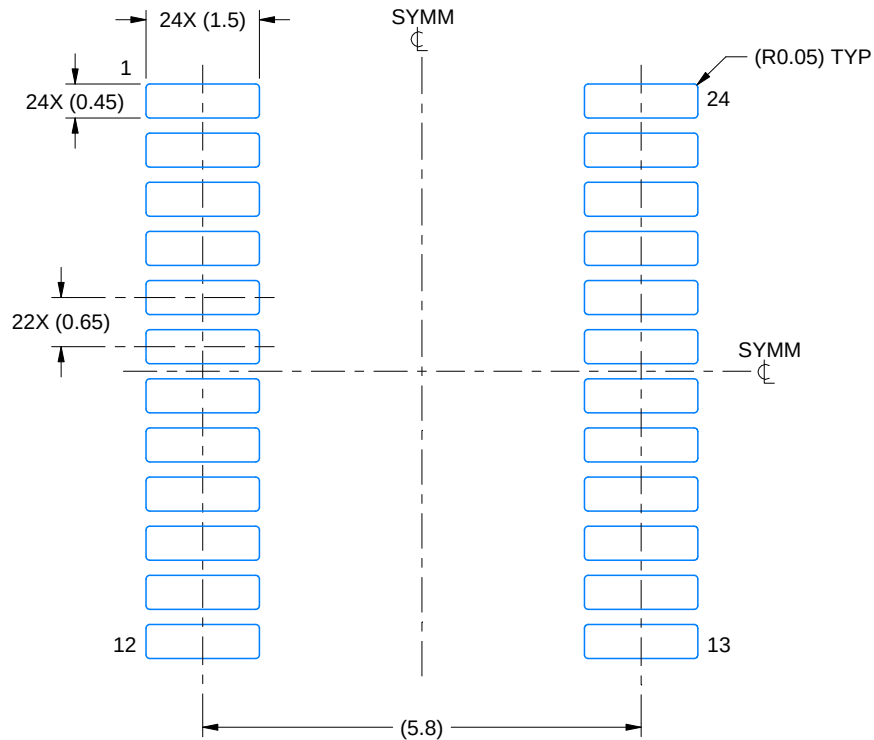


EXAMPLE BOARD LAYOUT

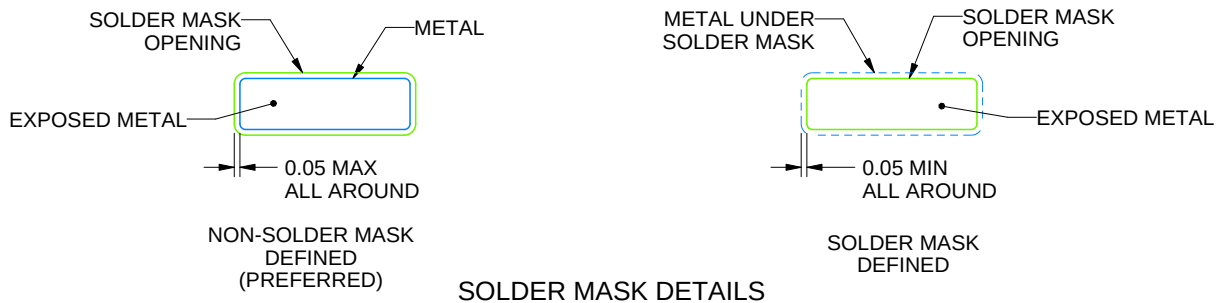
PW0024A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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.

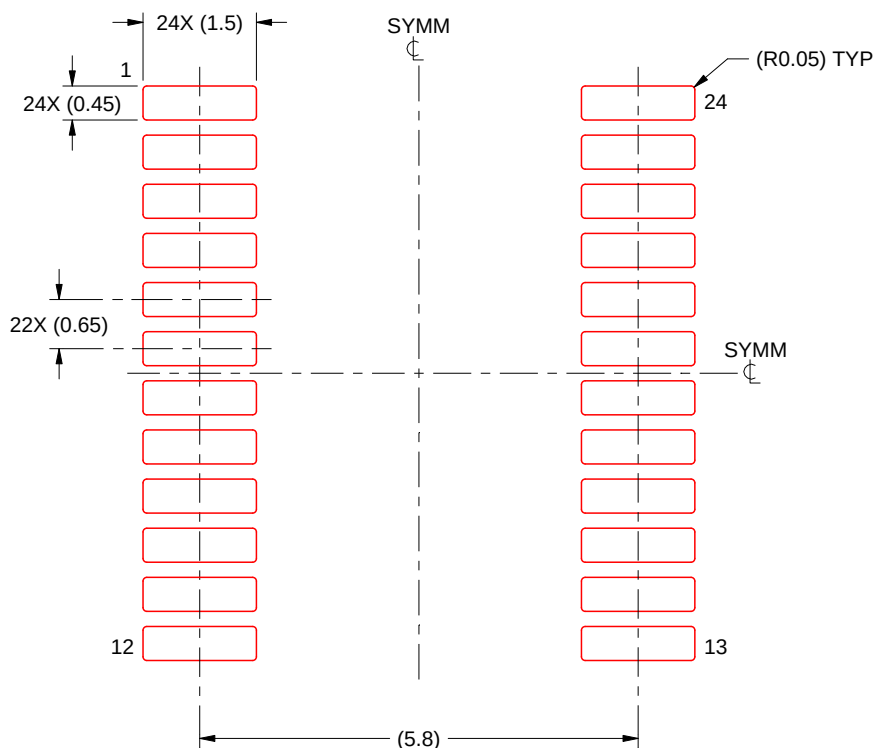
7. Solder mask tolerances between and around signal pads can vary based on board fabrication site.

EXAMPLE STENCIL DESIGN

PW0024A

TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE



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

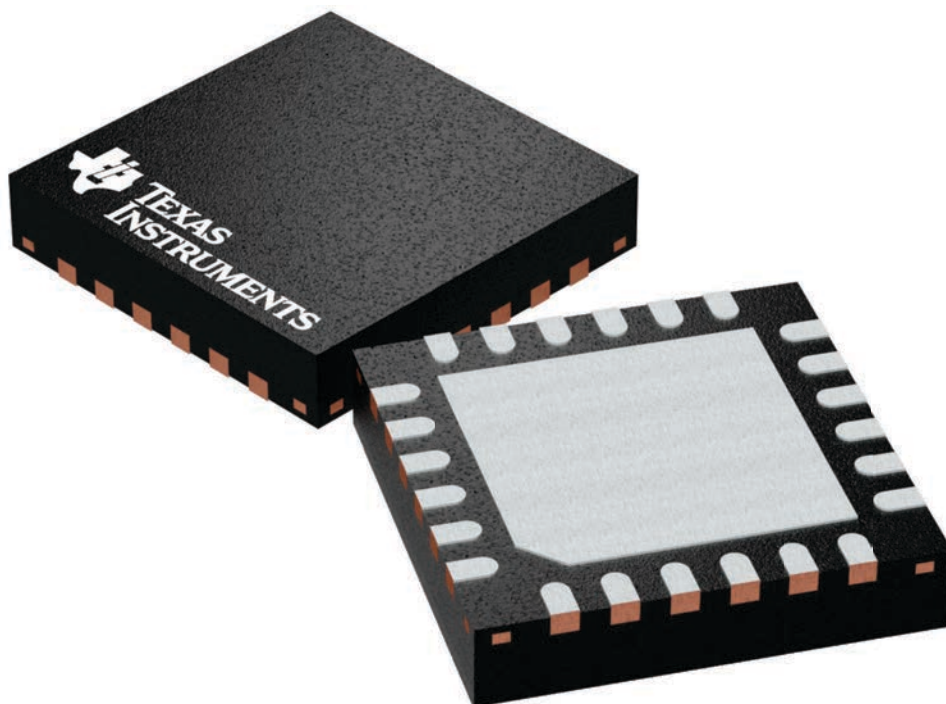
RTW 24

WQFN - 0.8 mm max height

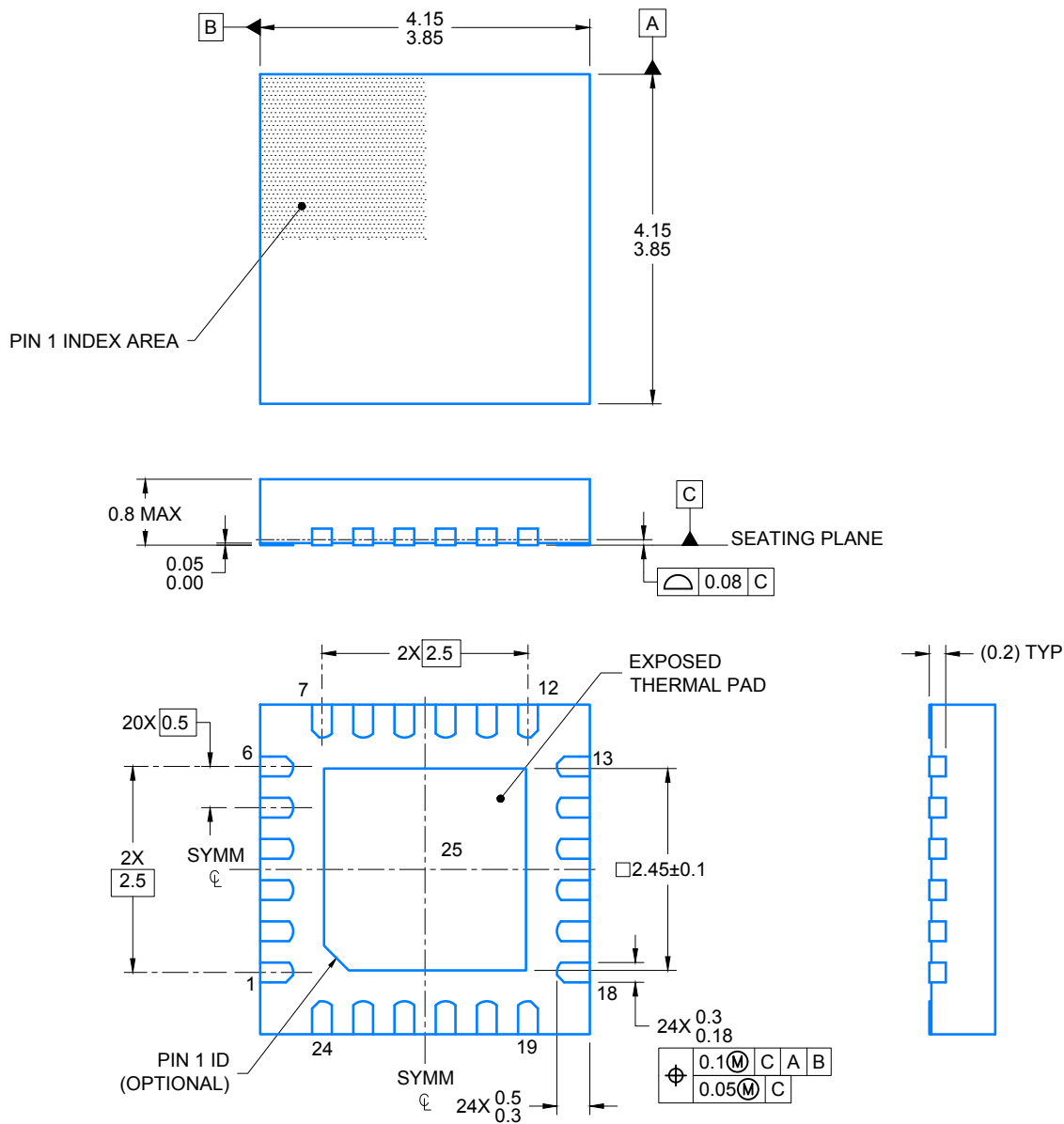
4 x 4, 0.5 mm pitch

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.



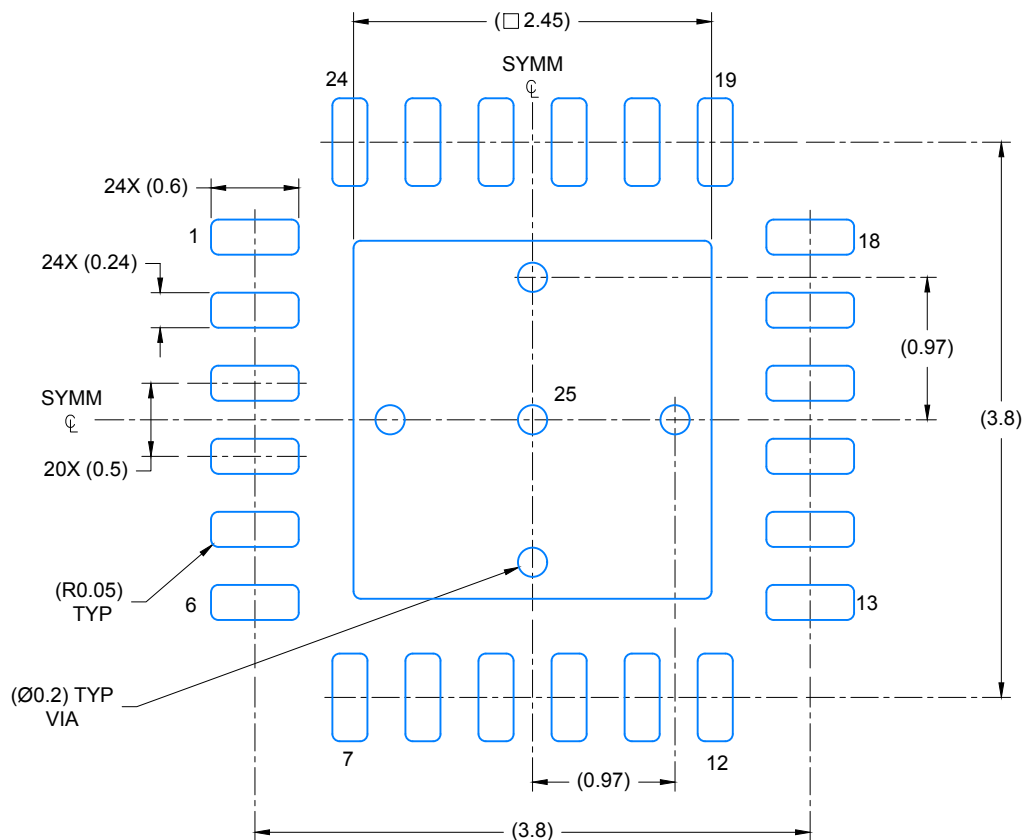
4224801/A



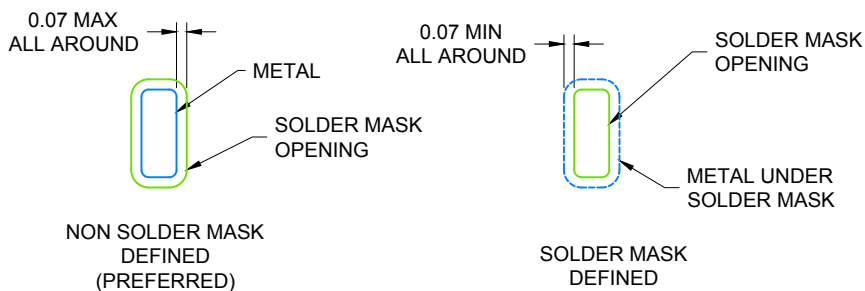
4219135/B 11/2016

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

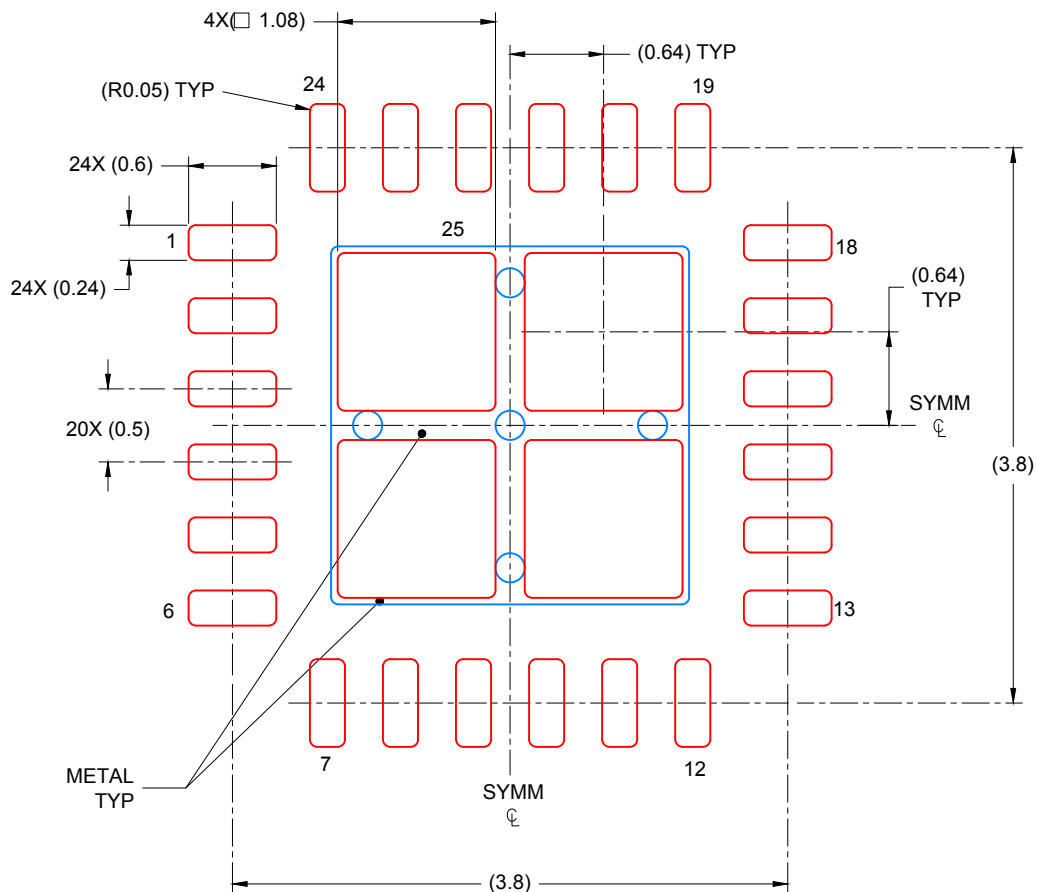


SOLDER MASK DETAILS

4219135/B 11/2016

NOTES: (continued)

- For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/sluea271).



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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