TS3A27518E-Q1 IEC L-4 ESD および 1.8V ロジック互換制御入力内蔵、6 ビット、1 : 2 マルチプレクサ / デマルチプレクサ

1 特長

- 車載アプリケーション認定済み
- 下記内容で AEC-Q100 認定済み:
  - デバイス温度グレード 2:-40℃～105℃の動作時周囲温度範囲
  - デバイス HBM ESD 分類レベル H2
  - デバイス CDM ESD 分類レベル C3B
- 機能安全対応
  - 機能安全システムの設計に役立つ資料を利用可能
- 1.65V～3.6V の単一電源で動作
- 電源オフ保護 (パワーダウン・モードでの絶縁、V_+ = 0 時にハイ・インピーダンス)
- 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
- 制御入力は 1.8V ロジックとスレッショルド互換
- 3.6V 許容の制御入力
- ESD 性能:NC/NO ポート
  - 接触放電 ±6kV (IEC 61000-4-2)
- 24 ピン TSSOP (7.80mm × 4.40mm) および 24 ピン QFN (4.00mm × 4.00mm) 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 (MUX)
- PC の VGA ビデオ・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

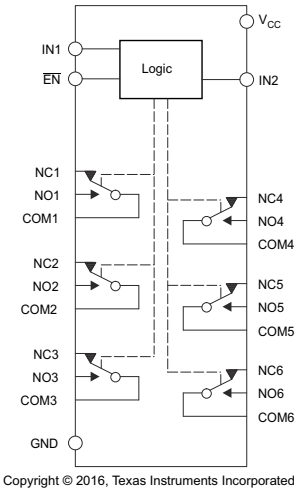
TS3A27518E-Q1 デバイスは、1.65V ～ 3.6V で動作するよう設計された 6 ビット 1:2 マルチプレクサ / デマルチプレクサです。このデバイスはデジタルとアナログの両方の信号を処理でき、V_+ までの信号をどちらの方向にも転送できます。TS3A27518E-Q1 は、どちらも 3 つの 1:2 マルチプレクサを同時に制御する 2 つの制御ピンと、すべての出力を高インピーダンス・モードにするためのイネーブル・ピンを備えています。制御ピンは 1.8V ロジックのスレッショルドと互換性があり、2.5V および 3.3V ロジックのスレッショルドとも下位互換性があります。

TS3A27518E-Q1 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。TS3A27518E-Q1 には、さらに柔軟な使い方を可能にする 2 つの制御ピンがあります。たとえば、LCD テレビ、LCD モニタ、ノート PC のドッキング・ステーションなどの機器内で、2 つの異なるオーディオ / ビデオ信号を多重化できます。

パッケージ情報 (1)

部品番号	パッケージ	本体サイズ (公称)
TS3A27518E-Q1	RTW (WQFN、24)	4.00mm × 4.00mm
	PW (TSSOP、24)	7.80mm × 4.40mm

(1) 利用可能な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。



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機能ブロック図

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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 C (January 2019) to Revision D (November 2022) **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
- 「*特長*」セクションに機能安全対応の情報を追加 ... 1

Changes from Revision B (May 2012) to Revision C (January 2019) **Page**

- 「製品情報」表、「ESD 定格」表、「推奨動作条件」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
- 文書全体にわたって表、図、相互参照の採番方法を更新 ... 1

Changes from Revision A (March 2012) to Revision B (May 2012) **Page**

- デバイスの温度グレードを 1 から 2 に変更、最大耐圧情報を削除、C3B2 を C3B に変更 ... 1
- 「注文情報」表に行を追加 ... 1
- Changed T_A = –40°C to 85°C to T_A = –40°C to 105°C ... 5
- Changed Full to –40°C to 85°C and added extra row with 85°C to 105°C and limits -7.5 to 7.5 ... 5
- Changed Full to –40°C to 85°C and added extra row with 85°C to 105°C with limits 68 ... 5
- Changed Full to –40°C to 85°C and added extra row with 85°C to 105°C with limits 70 ... 5
- Changed Full to –40°C to 85°C and added extra row with 85°C to 105°C with limits 5 µA ... 5
- Changed T_A = –40°C to 85°C to T_A = –40°C to 105°C ... 7
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- Changed Full to –40°C to 85°C and added extra row with 85°C to 105°C with limits 3 ... 7
- Changed T_A = –40°C to 85°C to T_A = –40°C to 105°C ... 9
- Changed Full to –40°C to 85°C and added extra row with 85°C to 105°C and limits –5.8 to 5.8 ... 9
- Changed Full to –40°C to 85°C and added extra row with 85°C to 105°C with limits 35.2 ... 9
- Changed Full to –40°C to 85°C and added extra row with 85°C to 105°C with limits 2.5 ... 9

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5 Pin Configuration and Functions

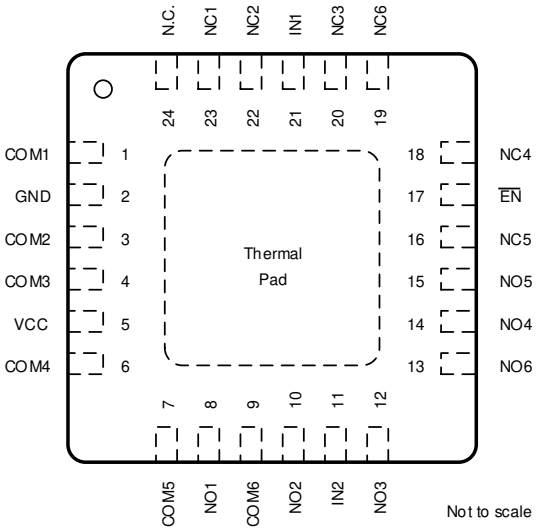


図 5-1. RTW Package, 24-Pin WQFN (Top View)

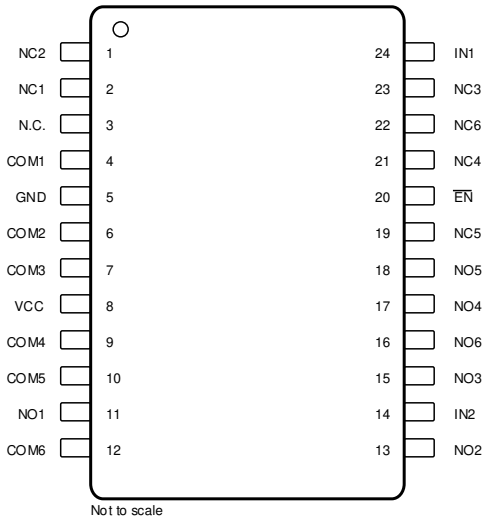


図 5-2. PW Package, 24-Pin TSSOP (Top View)

表 5-1. Pin Functions

PIN			TYPE(1)	DESCRIPTION
NAME	RTW	PW		
COM1	1	4	I/O	Common-signal path
COM2	3	6	I/O	Common-signal path
COM3	4	7	I/O	Common-signal path
COM4	6	9	I/O	Common-signal path
COM5	7	10	I/O	Common-signal path
COM6	9	12	I/O	Common-signal path
$\overline{EN}$	17	20	I	Digital control to enable or disable all signal paths
GND	2	5	—	Ground.
IN1	21	24	I	Digital control to connect COM to NC or NO
IN2	11	14	I	Digital control to connect COM to NC or NO
N.C.	24	3	—	Not connected
NC1	23	2	I/O	Normally closed-signal path
NC2	22	1	I/O	Normally closed-signal path
NC3	20	23	I/O	Normally closed-signal path
NC4	18	21	I/O	Normally closed-signal path
NC5	16	19	I/O	Normally closed-signal path
NC6	19	22	I/O	Normally closed-signal path
NO1	8	11	I/O	Normally open-signal path
NO2	10	13	I/O	Normally open-signal path
NO3	12	15	I/O	Normally open-signal path
NO4	14	17	I/O	Normally open-signal path
NO5	15	18	I/O	Normally open-signal path
NO6	13	16	I/O	Normally open-signal path
V_{CC}	5	8	—	Voltage supply

(1) I = input, O = output

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6 Specifications

6.1 Absolute Maximum Ratings

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

			MIN	MAX	UNIT
V_+	Supply voltage range(2)		–0.5	4.6	V
V_{NC} V_{NO} V_{COM}	Analog voltage range(2) (3) (4)		–0.5	4.6	V
I_K	Analog port diode current(5)	$V_+ < V_{NC}$, V_{NO}, $V_{COM} < 0$	–50		mA
I_{NC} I_{NO} I_{COM}	ON-state switch current(6)	V_{NC}, V_{NO}, V_{COM} = 0 to V_+	–50	50	mA
V_I	Digital input voltage range(2) (3)		–0.5	4.6	V
I_{IK}	Digital input clamp current(2) (3)	$V_{IO} < V_I < 0$	–50		mA
I_+	Continuous current through V_+			100	mA
I_{GND}	Continuous current through GND		–100		mA
T_{stg}	Storage temperature range		–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) All voltages are with respect to ground, unless otherwise specified.
(3) The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
(4) This value is limited to 5.5 V maximum.
(5) Requires clamp diodes on analog port to V_+.
(6) 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) AEC-Q100 Classification Level H2	±2000	V
		Charged-device model (CDM), per JEDEC specification JESD22-C101(2) AEC-Q100 Classification Level C3B	±750	

(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	V_{CC}	V
	V_{NO}			
	V_{COM}			
Digital input voltage	V_I	0	V_{CC}	V

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6.4 Thermal Information

THERMAL METRIC (1)		TS3A27518E		UNIT
		PW (TSSOP)	RTW (WQFN)	
		24 PINS	24 PINS	
$R_{\theta JA}$	Junction-to-ambient thermal resistance	104	40.7	°C/W
$R_{\theta JC(top)}$	Junction-to-case (top) thermal resistance	51.6	42.9	°C/W
$R_{\theta JB}$	Junction-to-board thermal resistance	57.5	19.2	°C/W
ψ_{JT}	Junction-to-top characterization parameter	9.9	1	°C/W
ψ_{JB}	Junction-to-board characterization parameter	57.1	19.3	°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_+ = 3 V to 3.6 V, T_A = –40°C to 105°C (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A	V_+	MIN	TYP	MAX	UNIT
Analog Switch									
ON-state resistance	r_{on}	0 ≤ (V_{NC} or V_{NO}) ≤ V_+, I_{COM} = –32 mA,	Switch ON, See 図 7-1	25°C	3 V		4.4	6.2	Ω
				Full				7.6	
ON-state resistance match between channels	Δr_{on}	V_{NC} or V_{NO} = 2.1 V, I_{COM} = –32 mA,	Switch ON, See 図 7-1	25°C	3 V		0.3	0.7	Ω
				Full				0.8	
ON-state resistance flatness	$r_{on(flat)}$	0 ≤ (V_{NC} or V_{NO}) ≤ V_+, I_{COM} = –32 mA,	Switch ON, See 図 7-2	25°C	3 V		0.95	2.1	Ω
				Full				2.3	
NC, NO OFF leakage current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	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 図 7-2	25°C	3.6 V	–0.5	0.05	0.5	µA
				Full		–7		7	
	$I_{NC(PWROFF)}$, $I_{NO(PWROFF)}$	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,		25°C	0 V	–1	0.05	1	
				Full		–12		12	
COM OFF leakage current	$I_{COM(OFF)}$	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 図 7-2	25°C	3.6 V	–1	0.01	1	µA
				Full		–2		2	
	$I_{COM(PWROFF)}$	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,		25°C	0 V	–1	0.02	1	
				Full		–12		12	
NC, NO ON leakage current	$I_{NO(ON)}$, $I_{NC(ON)}$	V_{NC} or V_{NO} = 1 V, V_{COM} = Open, or V_{NC} or V_{NO} = 3 V, V_{COM} = Open,	Switch ON, See 図 7-3	25°C	3.6 V	–2.5	0.04	2.2	µA
				–40°C to 85°C		–7		7	
				85°C to 105°C		–7.5		7.5	
COM ON leakage current	$I_{COM(ON)}$	V_{NC} or V_{NO} = Open, V_{COM} = 1 V, or V_{NC} or V_{NO} = Open, V_{COM} = 3 V,	Switch ON, See 図 7-3	25°C	3.6 V	–2	0.03	2	µA
				Full		–7		7	
Digital Control Inputs (IN1, IN2, $\overline{EN}$) (1)									
Input logic high	V_{IH}			Full	3.6 V	1.2		3.6	V
Input logic low	V_{IL}			Full	3.6 V	0		0.65	V

6.5 Electrical Characteristics for 3.3-V Supply (continued)

V_+ = 3 V to 3.6 V, T_A = –40°C to 105°C (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A	V_+	MIN	TYP	MAX	UNIT
Input leakage current	I_{IH}, I_{IL}	V_I = V_+ or 0		25°C	3.6 V	–0.1	0.05	0.1	µA
				Full		–2.5		2.5	
Dynamic									
Turn-on time	t_{ON}	V_{COM} = V_+, R_L = 50 Ω,	C_L = 35 pF, See 図 7-5	25°C	3.3 V		18.1	59	ns
				–40°C to 85°C	3 V to 3.6 V			60	
				85°C to 105°C				68	
Turn-off time	t_{OFF}	V_{COM} = V_+, R_L = 50 Ω,	C_L = 35 pF, See 図 7-5	25°C	3.3 V		25.4	60.6	ns
				–40°C to 85°C	3 V to 3.6 V			61	
				85°C to 105°C				70	
Break-before-make time	t_{BBM}	V_{NC} = V_{NO} = V_+/2, R_L = 50 Ω,	C_L = 35 pF, See 図 7-6	25°C	3.3 V	4	11.1	22.7	ns
				Full	3 V to 3.6 V			28	
Charge injection	Q_C	V_{GEN} = 0, R_{GEN} = 0,	C_L = 0.1 nF, See 図 7-10	25°C	3.3 V		0.81		pC
NC, NO OFF capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$	V_{NC} or V_{NO} = V_+ or GND, Switch OFF,	See 図 7-4	25°C	3.3 V		13		pF
COM OFF capacitance	$C_{COM(OFF)}$	V_{NC} or V_{NO} = V_+ or GND, Switch OFF,	See 図 7-4		3.3 V		8.5		pF
NC, NO ON capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$	V_{NC} or V_{NO} = V_+ or GND, Switch OFF,	See 図 7-4	25°C	3.3 V		21.5		pF
COM ON capacitance	$C_{COM(ON)}$	V_{COM} = V_+ or GND, Switch ON,	See 図 7-4	25°C	3.3 V		21.5		pF
Digital input capacitance	C_I	V_I = V_+ or GND	See 図 7-4	25°C	3.3 V		2		pF
Bandwidth	BW	R_L = 50 Ω,	Switch ON, See 図 7-6	25°C	3.3 V		240		MHz
OFF isolation	O_{ISO}	R_L = 50 Ω, f = 10 MHz,	Switch OFF, See 図 7-8	25°C	3.3 V		–62		dB
Crosstalk	X_{TALK}	R_L = 50 Ω, f = 10 MHz,	Switch ON, See 図 7-9	25°C	3.3 V		–62		dB
Crosstalk adjacent	$X_{TALK(ADJ)}$	R_L = 50 Ω, f = 10 MHz,	Switch ON, See 図 7-9	25°C	3.3 V		–71		dB
Total harmonic distortion	THD	R_L = 600 Ω, C_L = 50 pF,	f = 20 Hz to 20 kHz, See 図 7-11	25°C	3.3 V		0.05		%
Supply									
Positive supply current	I_+	V_I = V_+ or GND,	Switch ON or OFF	25°C	3.6 V		0.04	0.3	µA
				–40°C to 85°C				3	
				85°C to 105°C				5	

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

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6.6 Electrical Characteristics for 2.5-V Supply

V_+ = 2.3 V to 2.7 V, T_A = –40°C to 105°C (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A	V_+	MIN	TYP	MAX	UNIT
Analog Switch									
ON-state resistance	r_{on}	0 ≤ (V_{NC} or V_{NO}) ≤ V_+, I_{COM} = –32 mA,	Switch ON, See 図 7-1	25°C	2.3 V		5.5	9.6	Ω
				Full				11.5	
ON-state resistance match between channels	Δr_{on}	V_{NC} or V_{NO} = 1.6 V, I_{COM} = –32 mA,	Switch ON, See 図 7-1	25°C	2.3 V		0.3	0.8	Ω
				Full				0.9	
ON-state resistance flatness	$r_{on(flat)}$	0 ≤ (V_{NC} or V_{NO}) ≤ V_+, I_{COM} = –32 mA,	Switch ON, See 図 7-2	25°C	2.3 V		0.91	2.2	Ω
				Full				2.3	
NC, NO OFF leakage current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	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 図 7-2	25°C	2.7 V	–0.3	0.04	0.3	μA
				Full		–6		6	
	$I_{NC(PWROFF)}$, $I_{NO(PWROFF)}$	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,		25°C	0 V	–0.6	0.02	0.6	
				Full		–10		10	
COM OFF leakage current	$I_{COM(OFF)}$	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 図 7-2	25°C	2.7 V	–0.7	0.02	0.7	μA
				Full		–1		1	
	$I_{COM(PWROFF)}$	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,		25°C	0 V	–0.7	0.02	0.7	
				Full		–7.2		7.2	
NC, NO ON leakage current	$I_{NO(ON)}$, $I_{NC(ON)}$	V_{NC} or V_{NO} = 0.5 V or 2.3 V, V_{COM} = Open,	Switch ON, See 図 7-3	25°C	2.7 V	–2.1	0.03	2.1	μA
				Full		–6		6	
COM ON leakage current	$I_{COM(ON)}$	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 図 7-3	25°C	2.7 V	–2	0.02	2	μA
				Full		–5.7		5.7	
Digital Control Inputs (IN1, IN2, $\overline{EN}$)(1)									
Input logic high	V_{IH}	V_I = V_+ or GND		Full	2.7 V	1.15		3.6	V
Input logic low	V_{IL}			Full	2.7 V	0		0.55	V
Input leakage current	I_{IH}, I_{IL}	V_I = V_+ or 0		25°C	2.7 V	-0.1	0.01	0.1	μA
				Full		–2.1		2.1	
Dynamic									
Turn-on time	t_{ON}	V_{COM} = V+, R_L = 50 Ω,	C_L = 35 pF, See 図 7-5	25°C	2.5 V		17.2	36.8	ns
				Full	2.3 V to 2.7 V			42.5	
Turn-off time	t_{OFF}	V_{COM} = V+, R_L = 50 Ω,	C_L = 35 pF, See 図 7-5	25°C	2.5 V		17.1	29.8	ns
				–40°C to 85°C	2.3 V to 2.7 V			34.4	
				85°C to 105°C				38.4	
Break-before-make time	t_{BBM}	V_{NC} = V_{NO} = V_+/2, R_L = 50 Ω,	C_L = 35 pF, See 図 7-6	25°C	2.5 V	4.5	13	30	ns
				Full	2.3 V to 2.7 V			33.3	
Charge injection	Q_C	V_{GEN} = 0, R_{GEN} = 0,	C_L = 0.1 nF, See 図 7-10	25°C	2.5 V		0.47		pC
NC, NO OFF capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$	V_{NC} or V_{NO} = V_+ or GND, Switch OFF,	See 図 7-4	25°C	2.5 V		13.5		pF
COM OFF capacitance	$C_{COM(OFF)}$	V_{NC} or V_{NO} = V_+ or GND, Switch OFF,	See 図 7-4		2.5 V		9		pF

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6.6 Electrical Characteristics for 2.5-V Supply (continued)

V_+ = 2.3 V to 2.7 V, T_A = –40°C to 105°C (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A	V_+	MIN	TYP	MAX	UNIT
NC, NO ON capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$	V_{NC} or V_{NO} = V_+ or GND, Switch OFF,	See 図 7-4	25°C	2.5 V		22		pF
COM ON capacitance	$C_{COM(ON)}$	V_{COM} = V_+ or GND, Switch ON,	See 図 7-4	25°C	2.5 V		22		pF
Digital input capacitance	C_I	V_I = V_+ or GND	See 図 7-4	25°C	2.5 V		2		pF
Bandwidth	BW	R_L = 50 Ω,	Switch ON, See 図 7-6	25°C	2.5 V		240		MHz
OFF isolation	O_{ISO}	R_L = 50 Ω, f = 10 MHz,	Switch OFF, See 図 7-8	25°C	2.5 V		–62		dB
Crosstalk	X_{TALK}	R_L = 50 Ω, f = 10 MHz,	Switch ON, See 図 7-9	25°C	2.5 V		–62		dB
Crosstalk adjacent	$X_{TALK(ADJ)}$	R_L = 50 Ω, f = 10 MHz,	Switch ON, See 図 7-9	25°C	2.5 V		–71		dB
Total harmonic distortion	THD	R_L = 600 Ω, C_L = 50 pF,	f = 20 Hz to 20 kHz, See 図 7-11	25°C	2.5 V		0.06		%
Supply									
Positive supply current	I_+	V_I = V_+ or GND,	Switch ON or OFF	25°C	2.7 V		0.01	0.1	μA
				–40°C to 85°C				2	
				85°C to 105°C				3	

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

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6.7 Electrical Characteristics for 1.8-V Supply

V_+ = 1.65 V to 1.95 V, T_A = –40°C to 105°C (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A	V_+	MIN	TYP	MAX	UNIT
Analog Switch									
ON-state resistance	r_{on}	0 ≤ (V_{NC} or V_{NO}) ≤ V_+, I_{COM} = –32 mA,	Switch ON, See 図 7-1	25°C	1.65 V		7.1	14.4	Ω
				Full				16.3	
ON-state resistance match between channels	Δr_{on}	V_{NC} or V_{NO} = 1.5 V, I_{COM} = –32 mA,	Switch ON, See 図 7-1	25°C	1.65 V		0.3	1	Ω
				Full				1.2	
ON-state resistance flatness	$r_{on(flat)}$	0 ≤ (V_{NC} or V_{NO}) ≤ V_+, I_{COM} = –32 mA,	Switch ON, See 図 7-2	25°C	1.65 V		2.7	5.5	Ω
				Full				7.3	
NC, NO OFF leakage current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	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 図 7-2	25°C	1.95 V	–0.25	0.03	0.25	μA
				Full		–5		5	
	$I_{NC(PWROFF)}$, $I_{NO(PWROFF)}$	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,		25°C	0 V	–0.4	0.01	0.4	μA
				Full		–7.2		7.2	
COM OFF leakage current	$I_{COM(OFF)}$, $I_{COM(OFF)}$	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 図 7-2	25°C	1.95 V	–0.4	0.02	0.4	μA
				Full		–0.9		0.9	
	$I_{COM(PWROFF)}$, $I_{COM(PWROFF)}$	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,		25°C	0 V	–0.4	0.02	0.4	μA
				–40°C to 85°C		–5		5	
				85°C to 105°C		–5.8		5.8	
NC, NO ON leakage current	$I_{NO(ON)}$, $I_{NC(ON)}$	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 図 7-3	25°C	1.95 V	–2	0.02	2	μA
				Full		–5.2		5.2	
COM ON leakage current	$I_{COM(ON)}$	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 図 7-3	25°C	1.95 V	–2	0.02	2	μA
				Full		–5.2		5.2	
Digital Control Inputs (IN1, IN2, EN)(1)									
Input logic high	V_{IH}	V_I = V_+ or GND		Full	1.95 V	1		3.6	V
Input logic low	V_{IL}			Full	1.95 V	0		0.4	V
Input leakage current	I_{IH}, I_{IL}	V_I = V_+ or 0		25°C	1.95 V	-0.1	0.01	0.1	μA
				Full		-2.1		2.1	
Dynamic									
Turn-on time	t_{ON}	V_{COM} = V_+, R_L = 50 Ω,	C_L = 35 pF, See 図 7-5	25°C	1.8 V		14.1	49.3	ns
				Full	1.65 V to 1.95 V			56.7	
Turn-off time	t_{OFF}	V_{COM} = V_+, R_L = 50 Ω,	C_L = 35 pF, See 図 7-5	25°C	1.8 V		16.1	26.5	ns
				–40°C to 85°C	1.65 V to 1.95 V			31.2	
				85°C to 105°C				35.2	
Break-before-make time	t_{BBM}	V_{NC} = V_{NO} = V_+/2, R_L = 50 Ω,	C_L = 35 pF, See 図 7-6	25°C	1.8 V	5.3	18.4	58	ns
				Full	1.65 V to 1.95 V			58	
Charge injection	Q_C	V_{GEN} = 0, R_{GEN} = 0,	C_L = 1 nF, See 図 7-10	25°C	1.8 V		0.21		pC

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6.7 Electrical Characteristics for 1.8-V Supply (continued)

V_+ = 1.65 V to 1.95 V, T_A = –40°C to 105°C (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A	V_+	MIN	TYP	MAX	UNIT
NC, NO OFF capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$	V_{NC} or V_{NO} = V_+ or GND, Switch OFF,	See 図 7-4	25°C	1.8 V		9		pF
NC, NO ON capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$	V_{NC} or V_{NO} = V_+ or GND, Switch OFF,	See 図 7-4	25°C	1.8 V		22		pF
COM ON capacitance	$C_{COM(ON)}$	V_{COM} = V_+ or GND, Switch ON,	See 図 7-4	25°C	1.8 V		22		pF
Digital input capacitance	C_I	V_I = V_+ or GND	See 図 7-4	25°C	1.8 V		2		pF
Bandwidth	BW	R_L = 50 Ω,	Switch ON, See 図 7-6	25°C	1.8 V		240		MHz
OFF isolation	O_{ISO}	R_L = 50 Ω, f = 10 MHz,	Switch OFF, See 図 7-8	25°C	1.8 V		-60		dB
Crosstalk	X_{TALK}	R_L = 50 Ω, f = 10 MHz,	Switch ON, See 図 7-9	25°C	1.8 V		-60		dB
Crosstalk adjacent	$X_{TALK(ADJ)}$	R_L = 50 Ω, f = 10 MHz,	Switch ON, See 図 7-9	25°C	1.8 V		-71		dB
Total harmonic distortion	THD	R_L = 600 Ω, C_L = 50 pF,	f = 20 Hz to 20 kHz, See 図 7-11	25°C	1.8 V		0.1		%
Supply									
Positive supply current	I_+	V_I = V_+ or GND,	Switch ON or OFF	25°C	1.95 V		0.01	0.1	μA
				–40°C to 85°C				1.5	
				85°C to 105°C				2.5	

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

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6.8 Typical Characteristics

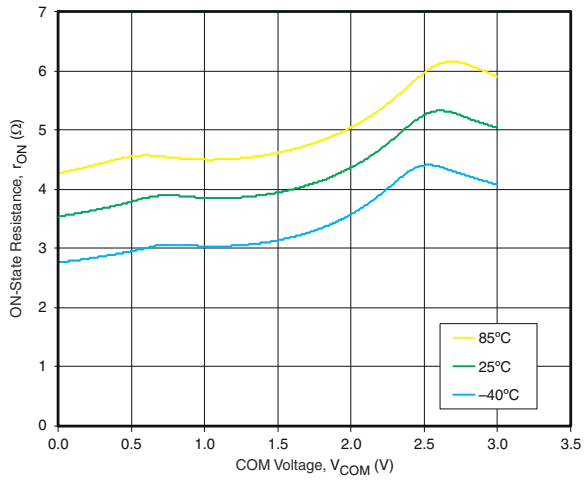


図 6-1. ON-State Resistance vs COM Voltage (V_{CC} = 3 V)

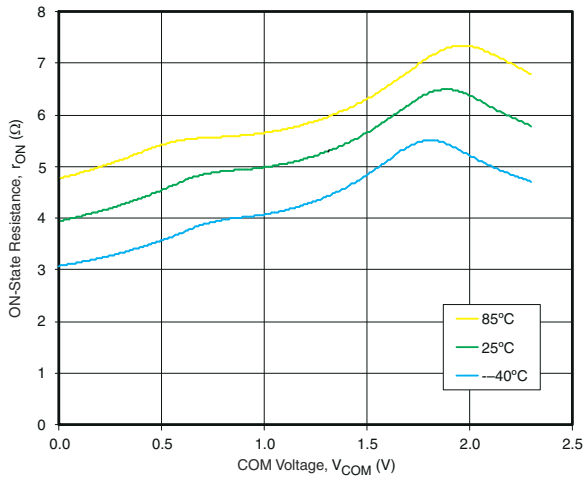


図 6-2. ON-State Resistance vs COM Voltage (V_{CC} = 2.3 V)

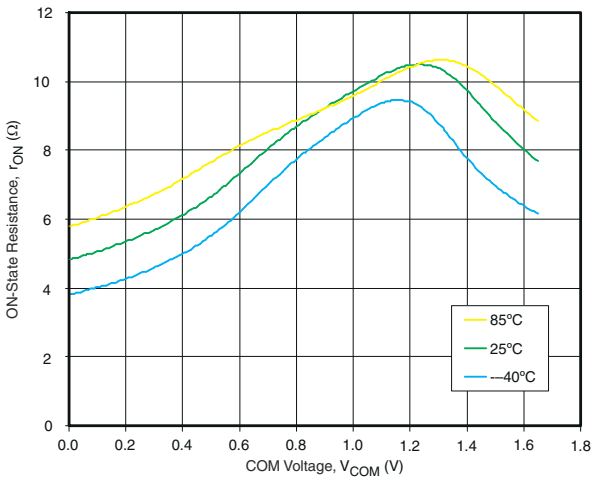


図 6-3. ON-State Resistance vs COM Voltage (V_{CC} = 1.65 V)

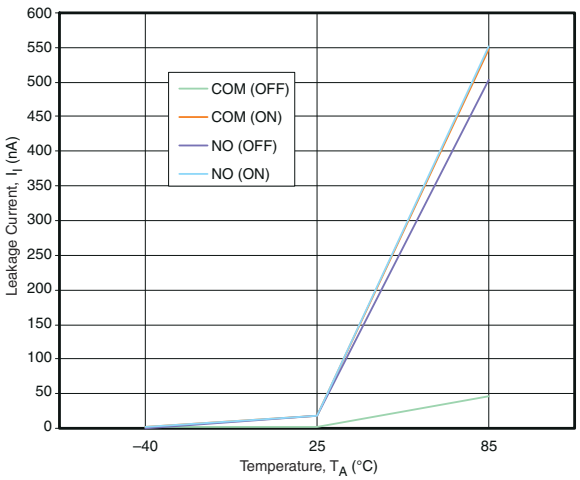


図 6-4. Leakage Current vs Temperature (V_{CC} = 3.3 V)

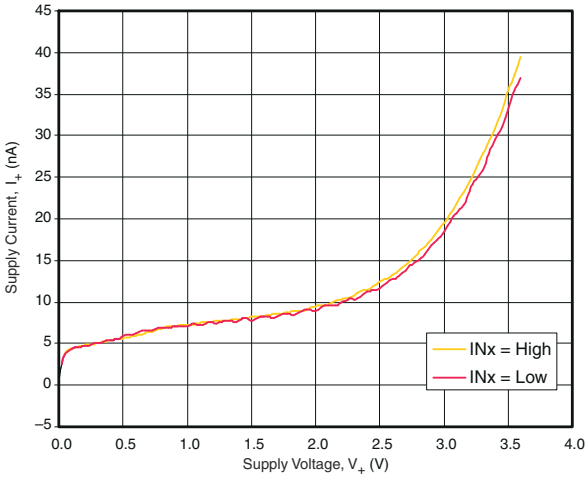


図 6-5. Supply Current vs Supply Voltage

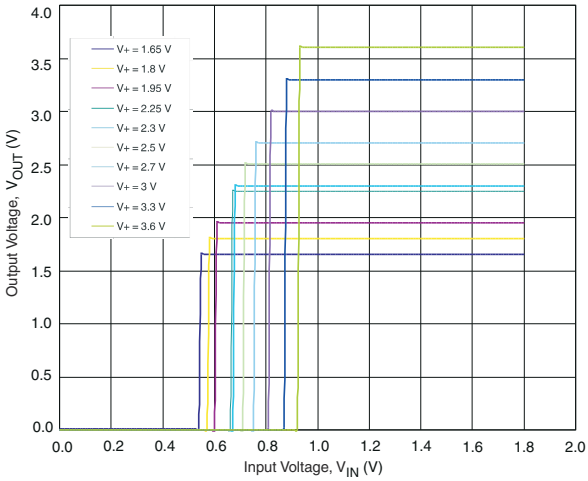


図 6-6. Control Input Thresholds (IN1, T_A = 25°C)

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6.8 Typical Characteristics (continued)

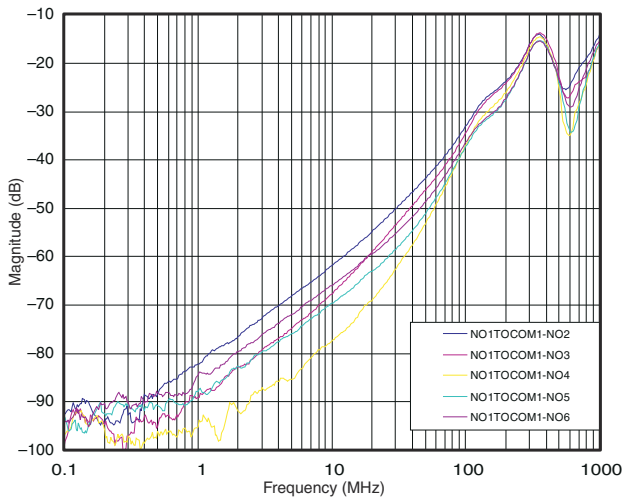


図 6-7. Crosstalk Adjacent

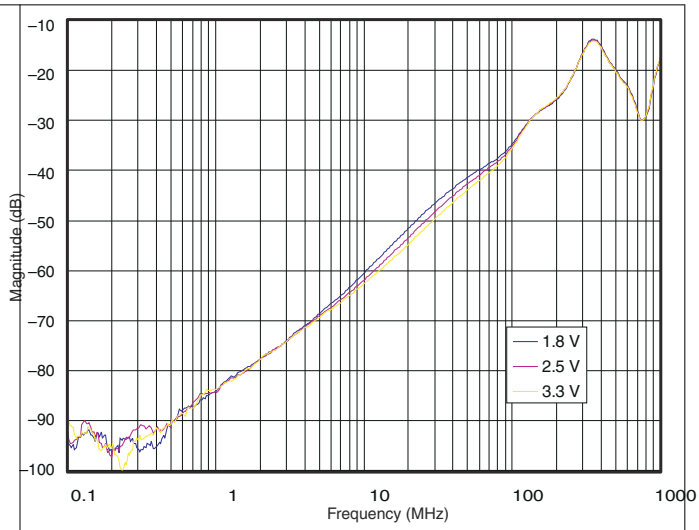


図 6-8. Crosstalk

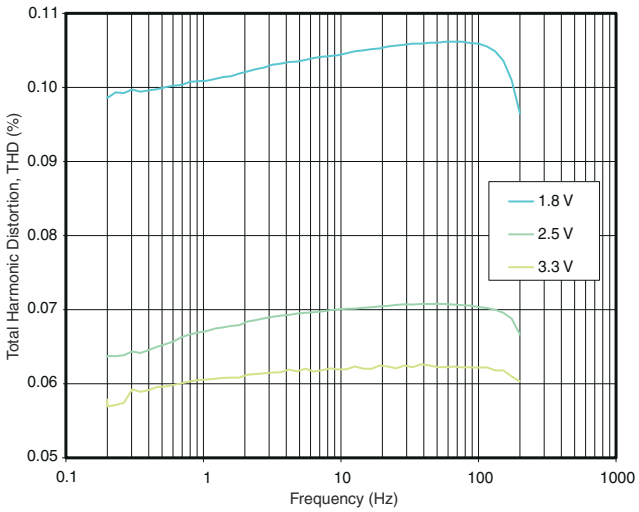


図 6-9. Total Harmonic Distortion vs Frequency

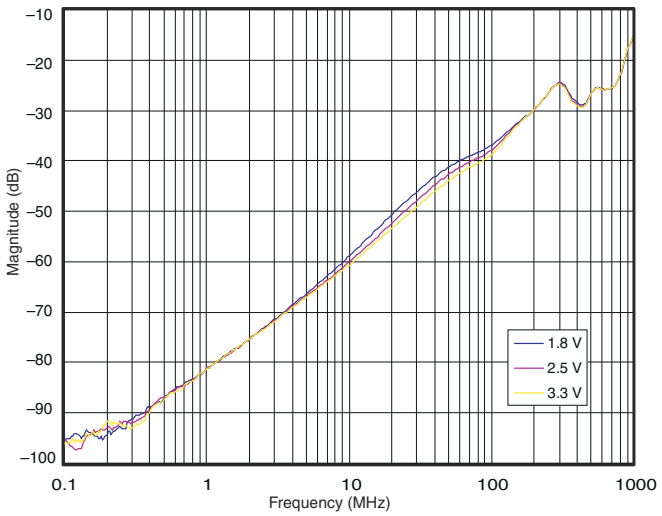


図 6-10. OFF Isolation

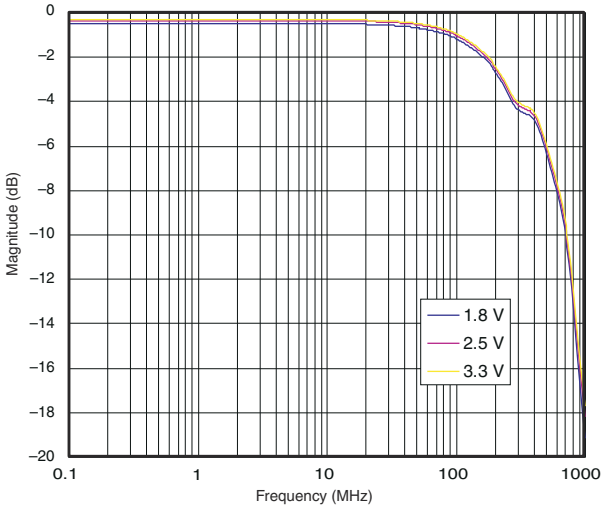


図 6-11. Insertion Loss

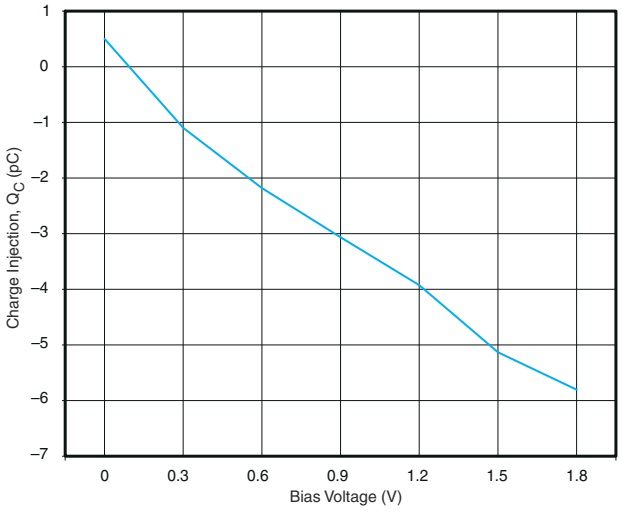


図 6-12. Charge Injection vs Bias Voltage (1.8 V)

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6.8 Typical Characteristics (continued)

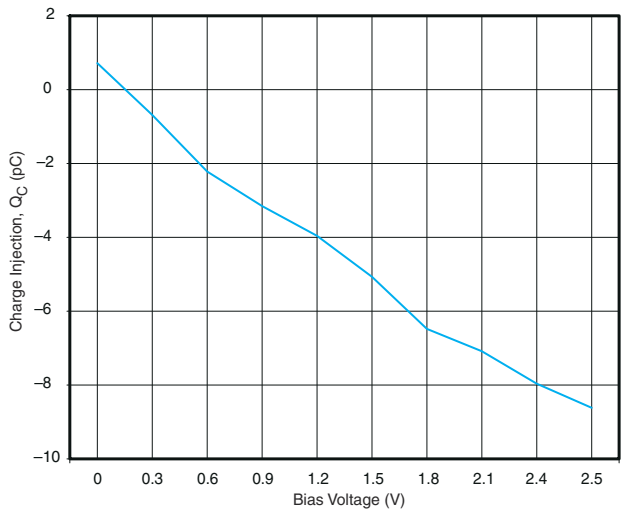


図 6-13. Charge Injection vs Bias Voltage (2.5 V)

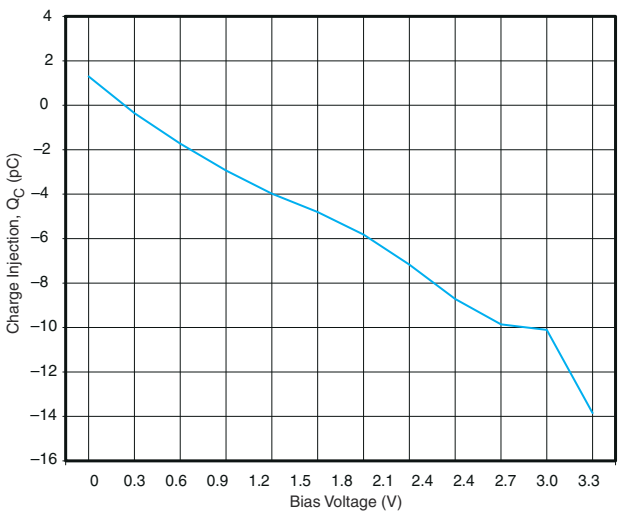


図 6-14. Charge Injection vs Bias Voltage (3.3 V)

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7 Parameter Measurement Information

表 7-1. Parameter Description

SYMBOL	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}	Turn-on 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}	Turn-off 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_+	Static power-supply current with the control (IN) pin at V_+ or GND

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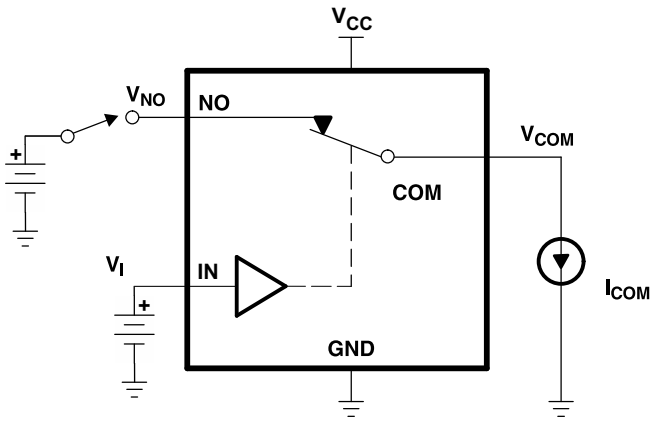


図 7-1. ON-state Resistance (r_{ON})

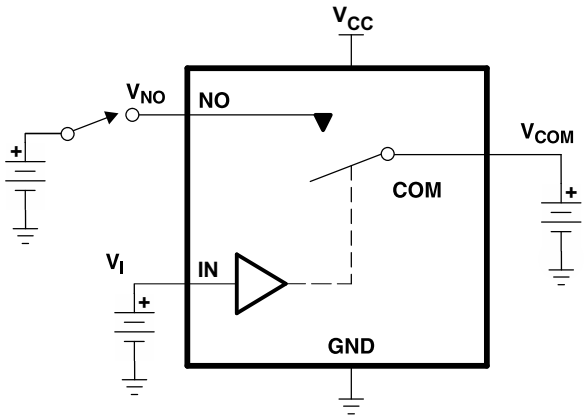


図 7-2. OFF-State Leakage Current ($I_{COM(OFF)}$, $I_{NC(OFF)}$, $I_{COM(PWROFF)}$, $I_{NC(PWROFF)}$)

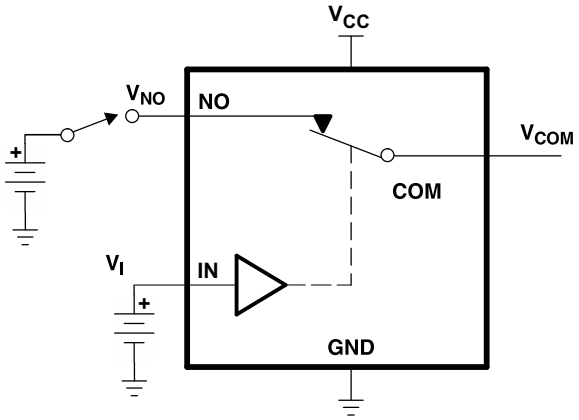


図 7-3. ON-State Leakage Current ($I_{COM(ON)}$, $I_{NC(ON)}$)

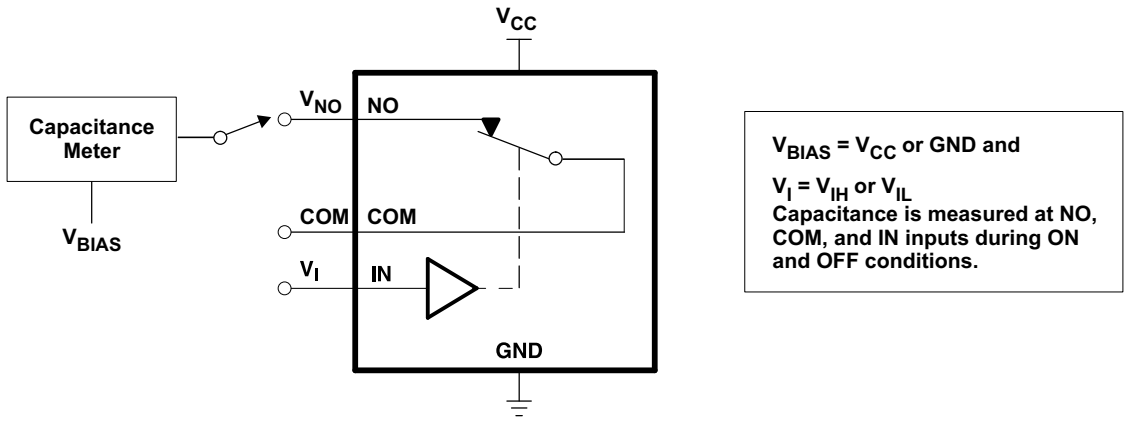
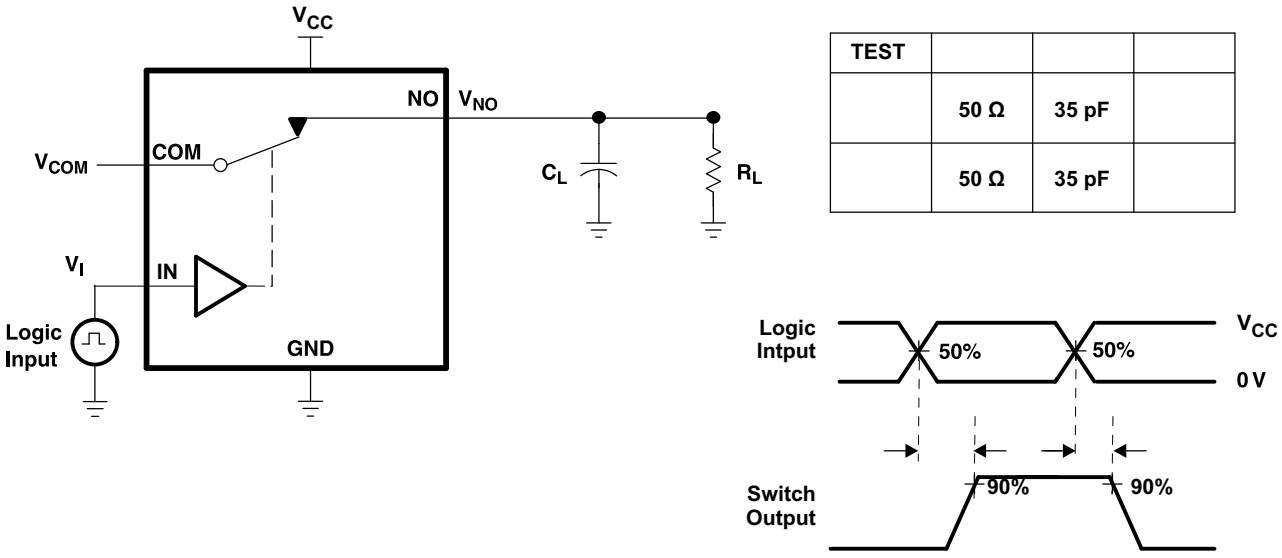
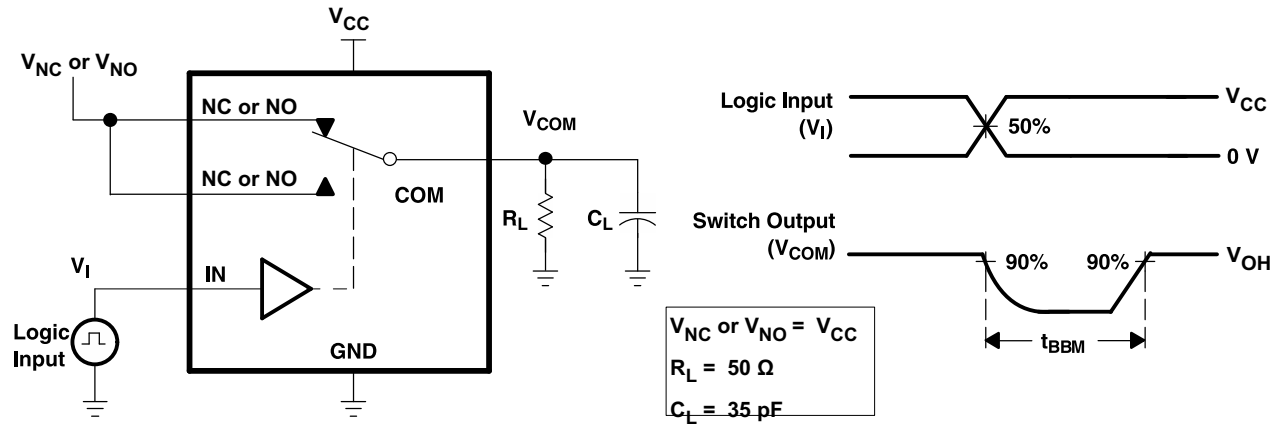


図 7-4. Capacitance (C_I, $C_{COM(OFF)}$, $C_{COM(ON)}$, $C_{NC(OFF)}$, $C_{NC(ON)}$)



A. 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.
B. C_L includes probe and jig capacitance.

図 7-5. Turn-On (t_{ON}) and Turn-Off Time (t_{OFF})



A. C_L includes probe and jig capacitance.
B. 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.

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

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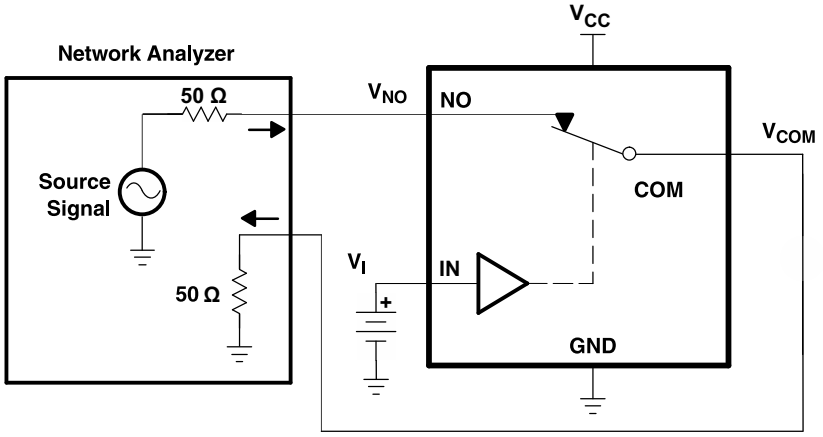


図 7-7. Bandwidth (BW)

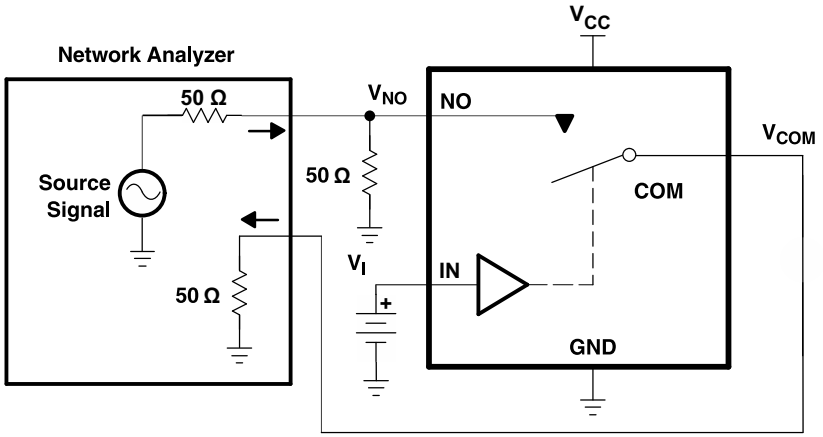


図 7-8. OFF Isolation (O_{ISO})

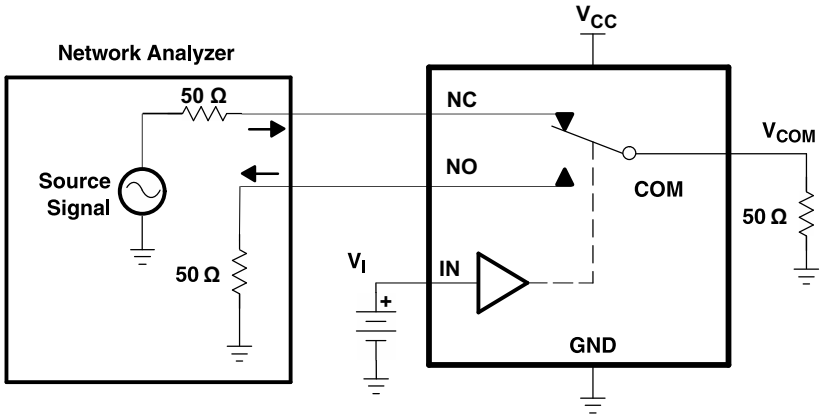
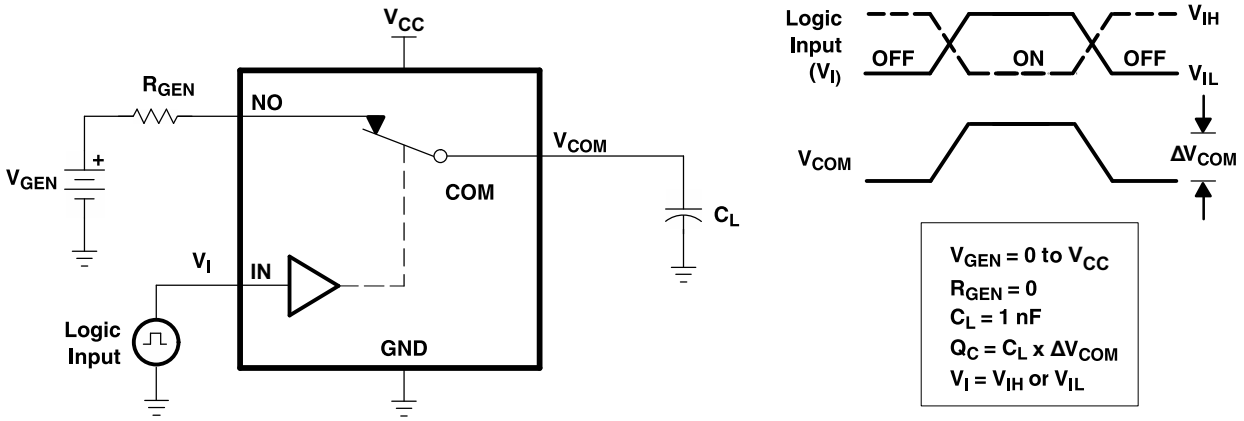


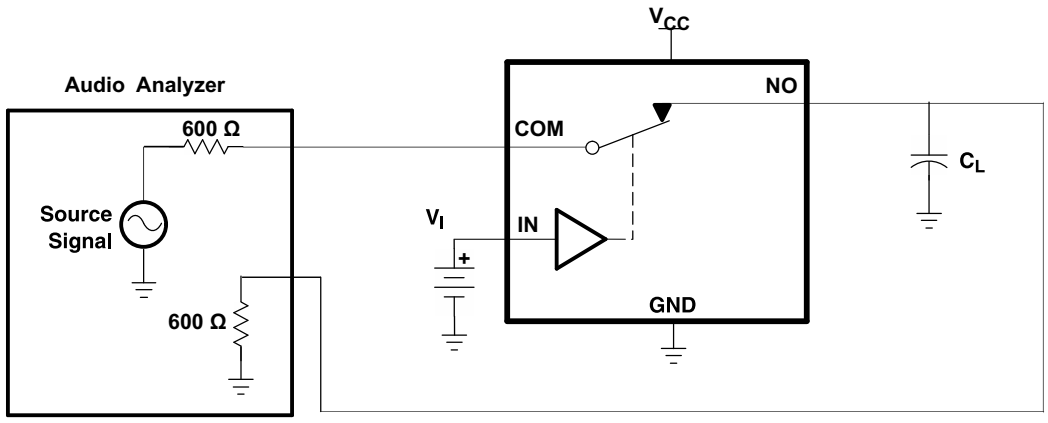
図 7-9. Crosstalk (X_{TALK})



A. 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.
B. C_L includes probe and jig capacitance.

図 7-10. Charge Injection (Q_C)

Channel ON: COM to NO	V_I = V_{IH} or V_{IL}	R_L = 600 Ω
V_{SOURCE} = V_{CC} P-P	f_{SOURCE} = 20 Hz to 20 kHz	C_L = 50 pF



A. C_L includes probe and jig capacitance.

図 7-11. Total Harmonic Distortion (THD)

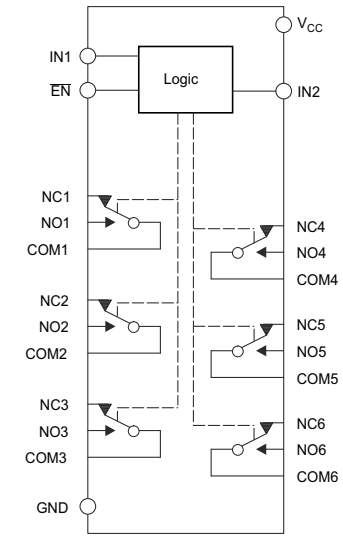
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8 Detailed Description

8.1 Overview

The TS3A27518E-Q1 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-Q1 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-Q1 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 TS3A27518E-Q1 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-Q1.

表 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

9 Application and Implementation

注

以下のアプリケーション情報は、TI の製品仕様に含まれるものではなく、TI ではその正確性または完全性を保証いたしません。個々の目的に対する製品の適合性については、お客様の責任で判断していただくことになります。お客様は自身の設計実装を検証しテストすることで、システムの機能を確認する必要があります。

9.1 Application Information

The switches are bidirectional, so the NO, NC, and COM pins can be used as either inputs or outputs.

9.2 Typical Application

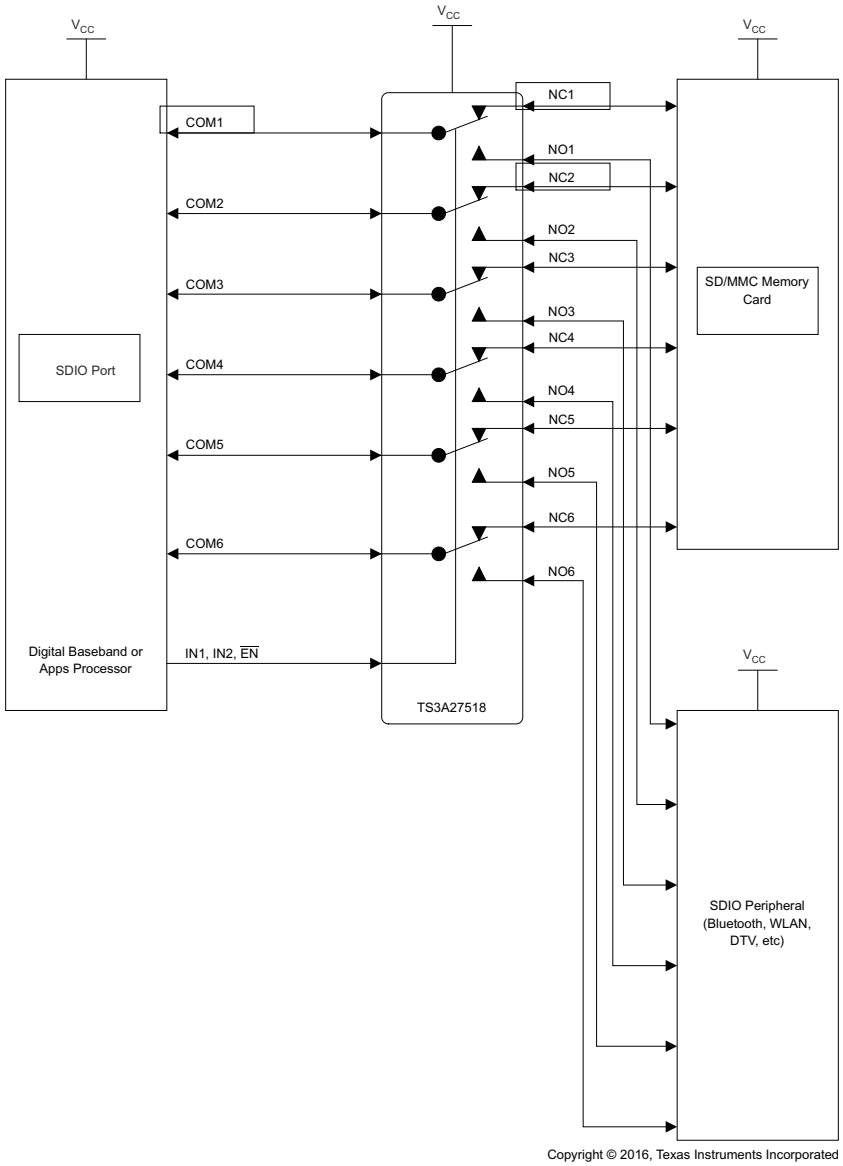


図 9-1. SDIO Expander Application Block Diagram

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. For more information, see *セクション 6.3*.

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9.2.2 Detailed Design Procedure

The TS3A27518E-Q1 can operate properly 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.

For the RTW package connect the thermal pad to ground.

9.2.3 Application Curves

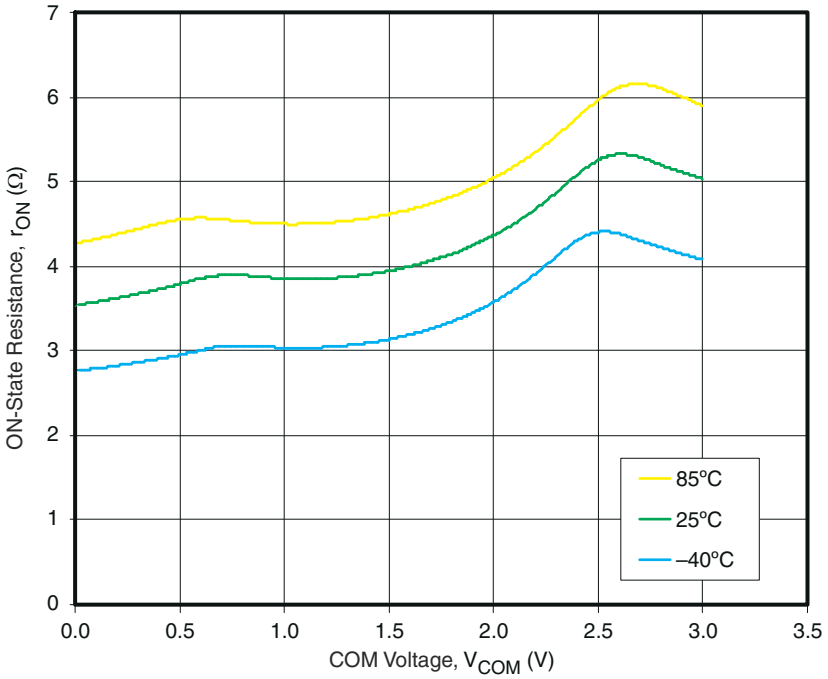


図 9-2. ON-State Resistance vs COM Voltage (V_{CC} = 3 V)

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

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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

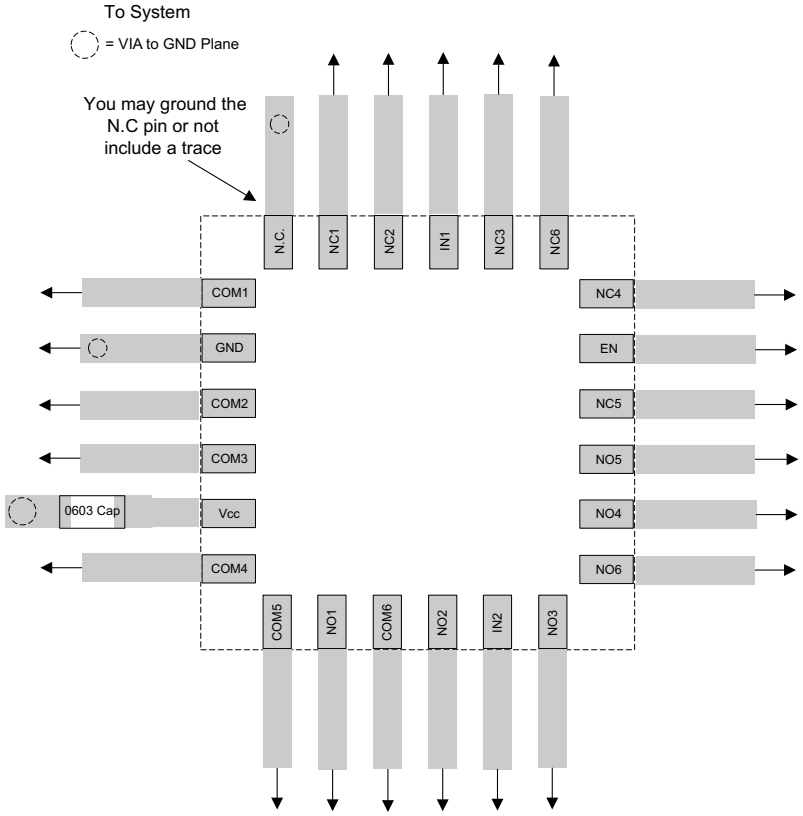


図 11-1. WQFN Layout Recommendation

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12 Device and Documentation Support

12.1 Documentation Support

12.1.1 Related Documentation

For related documentation, see the following:

- Texas Instruments, *TS3A27518E-Q1 Functional Safety FIT Rate, FMD and Pin FMA* report

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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12.5 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)
TS3A27518EIPWRQ1	Active	Production	TSSOP (PW) | 24	2000 | LARGE T&R	Yes	NIPDAU	Level-3-260C-168 HR	-40 to 85	YL518EQ1
TS3A27518EIPWRQ1.B	Active	Production	TSSOP (PW) | 24	2000 | LARGE T&R	Yes	NIPDAU	Level-3-260C-168 HR	-40 to 85	YL518EQ1
TS3A27518EIRTWRQ1	Active	Production	WQFN (RTW) | 24	3000 | LARGE T&R	Yes	NIPDAU	Level-3-260C-168 HR	-40 to 85	27518EI
TS3A27518EIRTWRQ1.B	Active	Production	WQFN (RTW) | 24	3000 | LARGE T&R	Yes	NIPDAU	Level-3-260C-168 HR	-40 to 85	27518EI
TS3A27518ETRTWRQ1	Active	Production	WQFN (RTW) | 24	3000 | LARGE T&R	Yes	NIPDAU	Level-3-260C-168 HR	-40 to 105	27518ET
TS3A27518ETRTWRQ1.B	Active	Production	WQFN (RTW) | 24	3000 | LARGE T&R	Yes	NIPDAU	Level-3-260C-168 HR	-40 to 105	27518ET

(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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

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-Q1 :

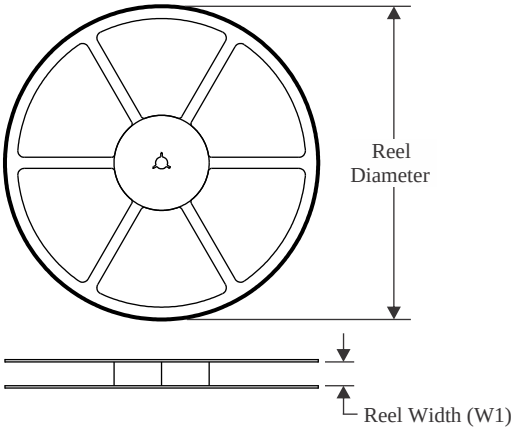
- Catalog : TS3A27518E

NOTE: Qualified Version Definitions:

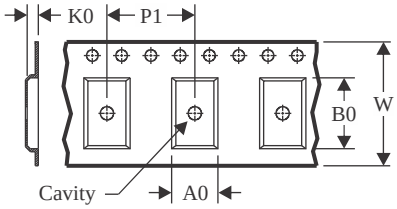
- Catalog - TI's standard catalog product

TAPE AND REEL INFORMATION

REEL DIMENSIONS

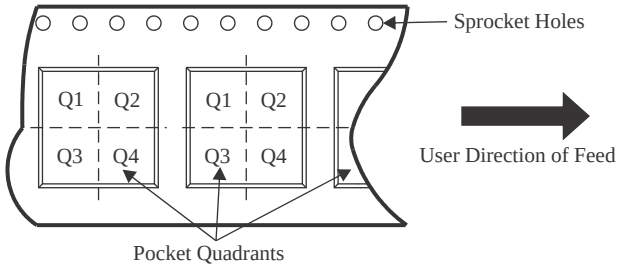


TAPE DIMENSIONS



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

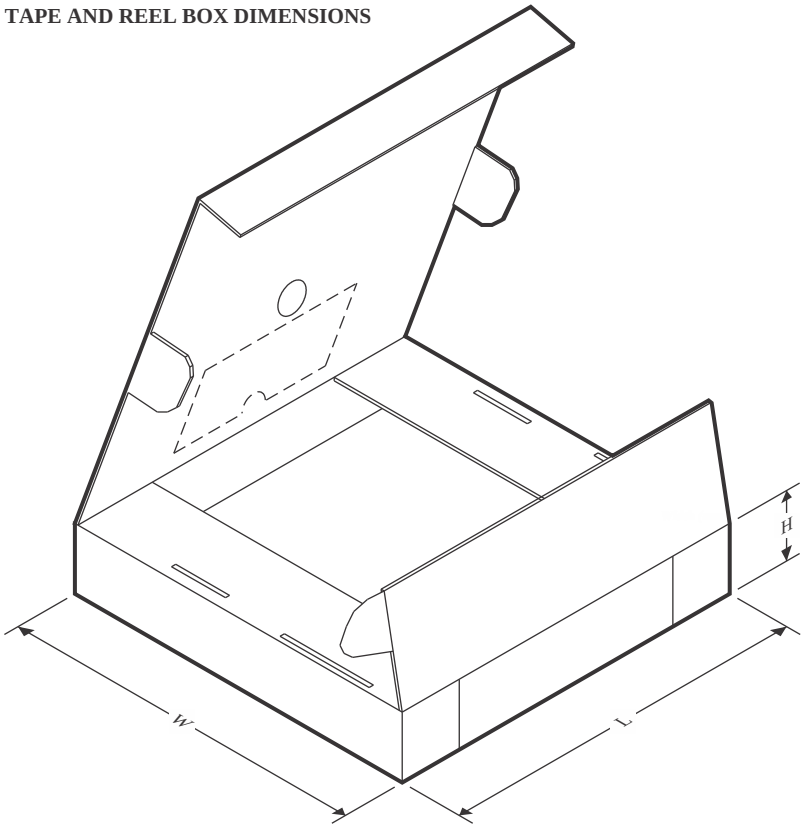
QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



*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
TS3A27518EIPWRQ1	TSSOP	PW	24	2000	330.0	16.4	6.95	8.3	1.6	8.0	16.0	Q1
TS3A27518EIRTWRQ1	WQFN	RTW	24	3000	330.0	12.4	4.25	4.25	1.15	8.0	12.0	Q2
TS3A27518ETRTWRQ1	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

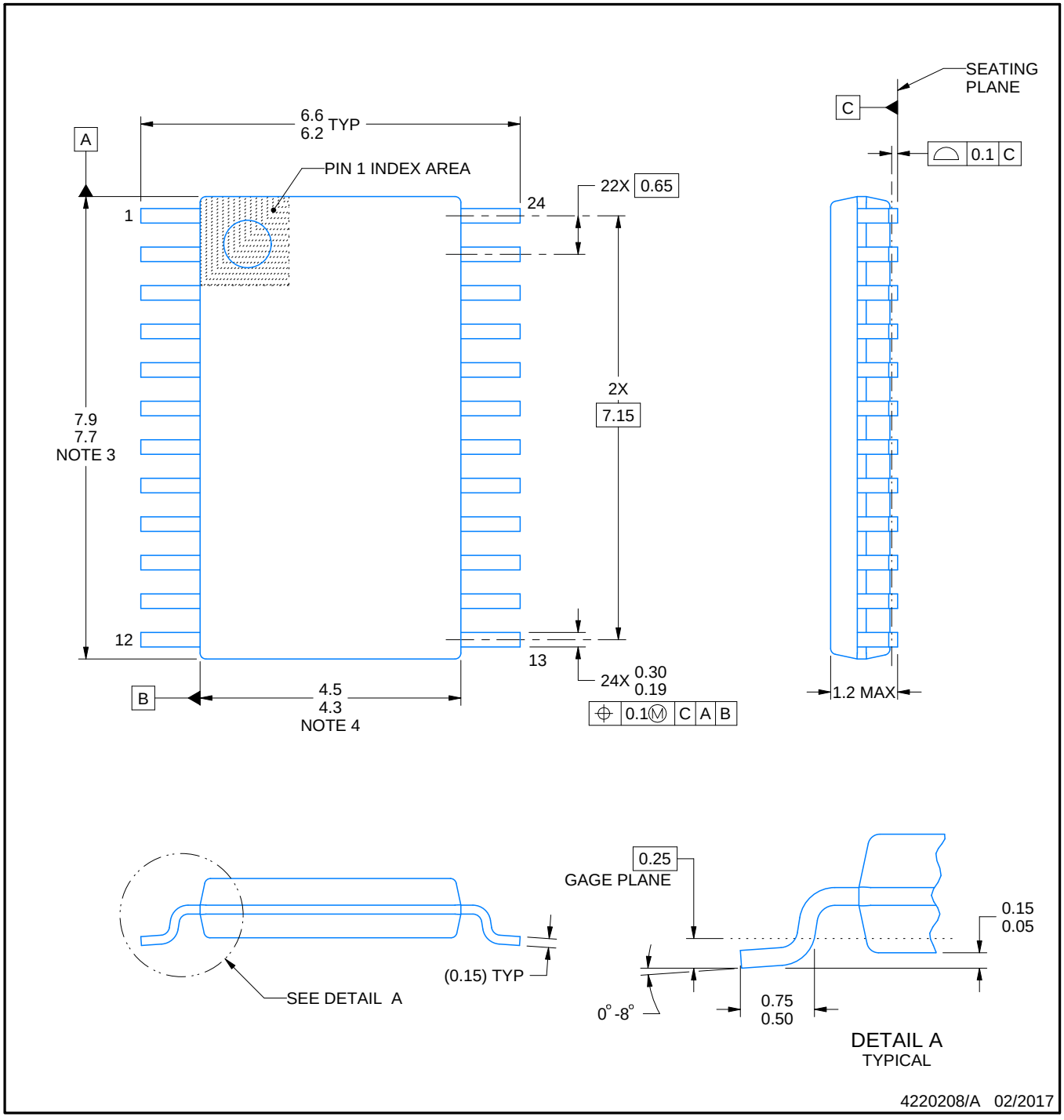
Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TS3A27518EIPWRQ1	TSSOP	PW	24	2000	353.0	353.0	32.0
TS3A27518EIRTWRQ1	WQFN	RTW	24	3000	353.0	353.0	32.0
TS3A27518ETRTWRQ1	WQFN	RTW	24	3000	353.0	353.0	32.0

PACKAGE OUTLINE

PW0024A

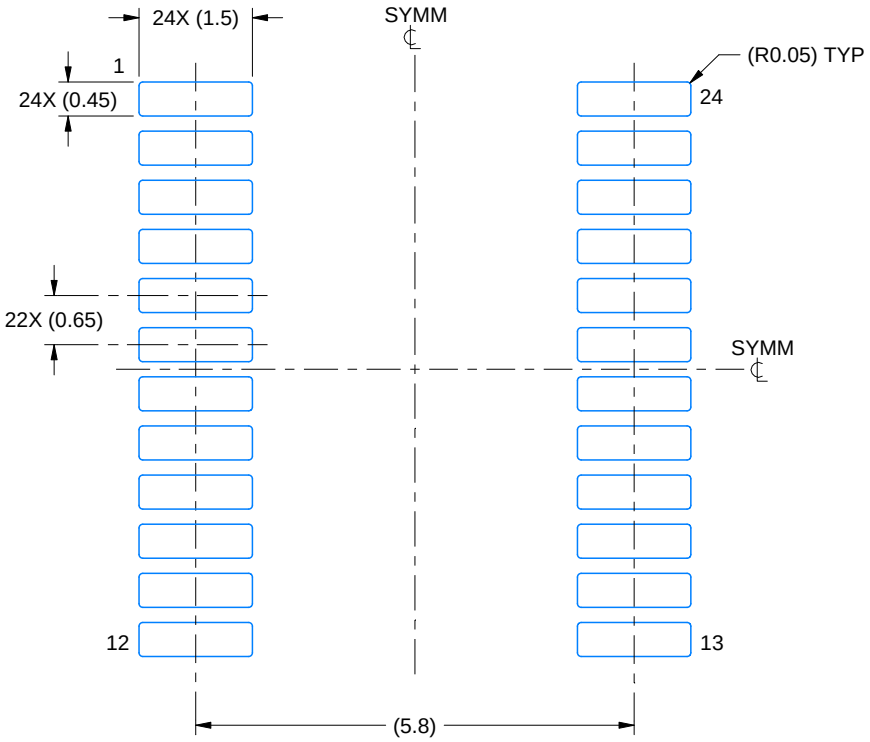
TSSOP - 1.2 mm max height

SMALL OUTLINE PACKAGE

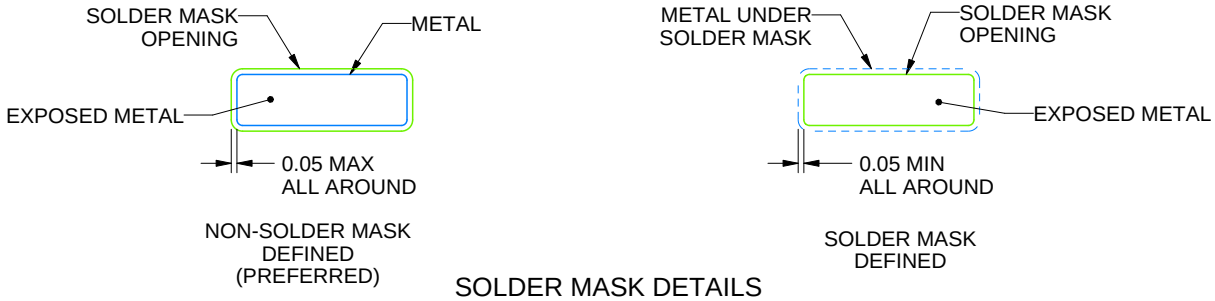


NOTES:

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

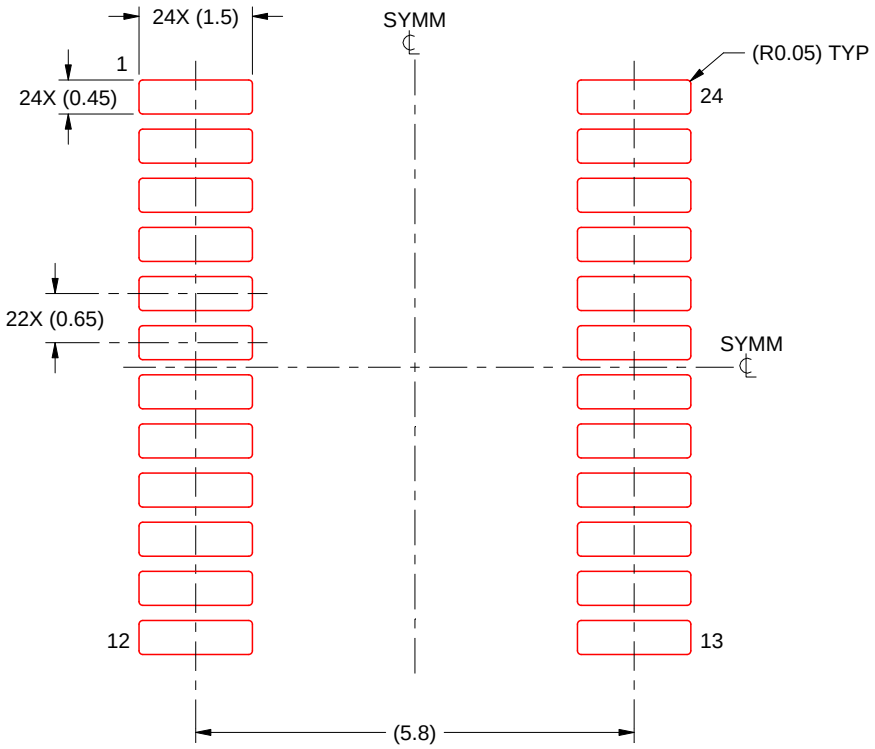


SOLDER MASK DETAILS

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

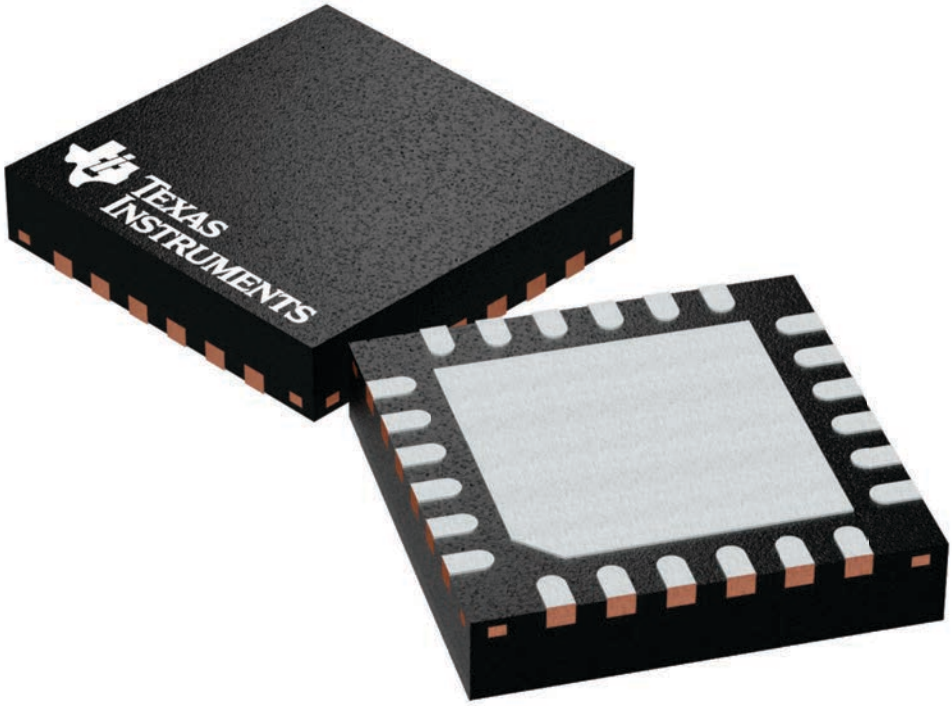
RTW 24

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.



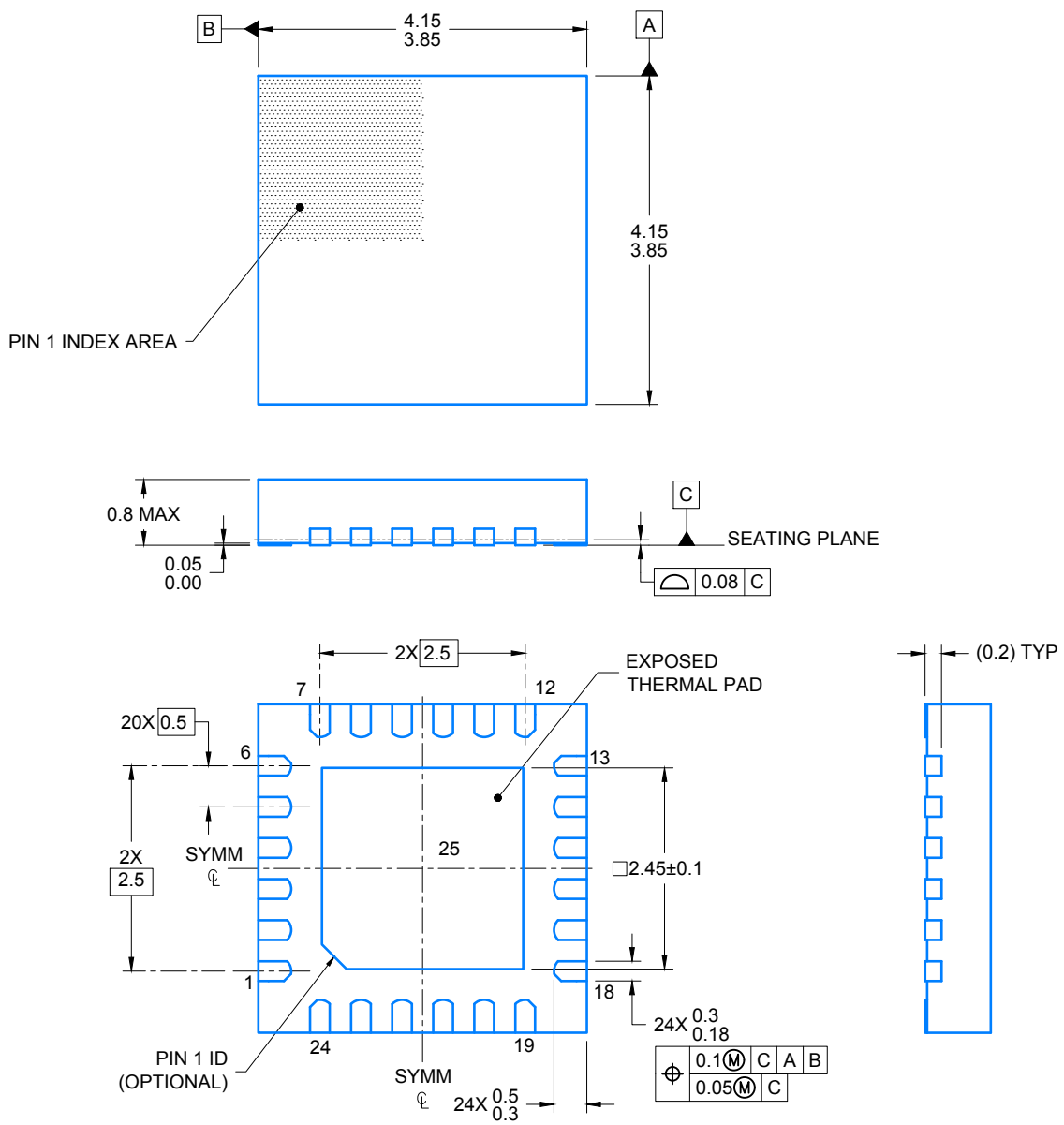
4224801/A

PACKAGE OUTLINE

RTW0024B

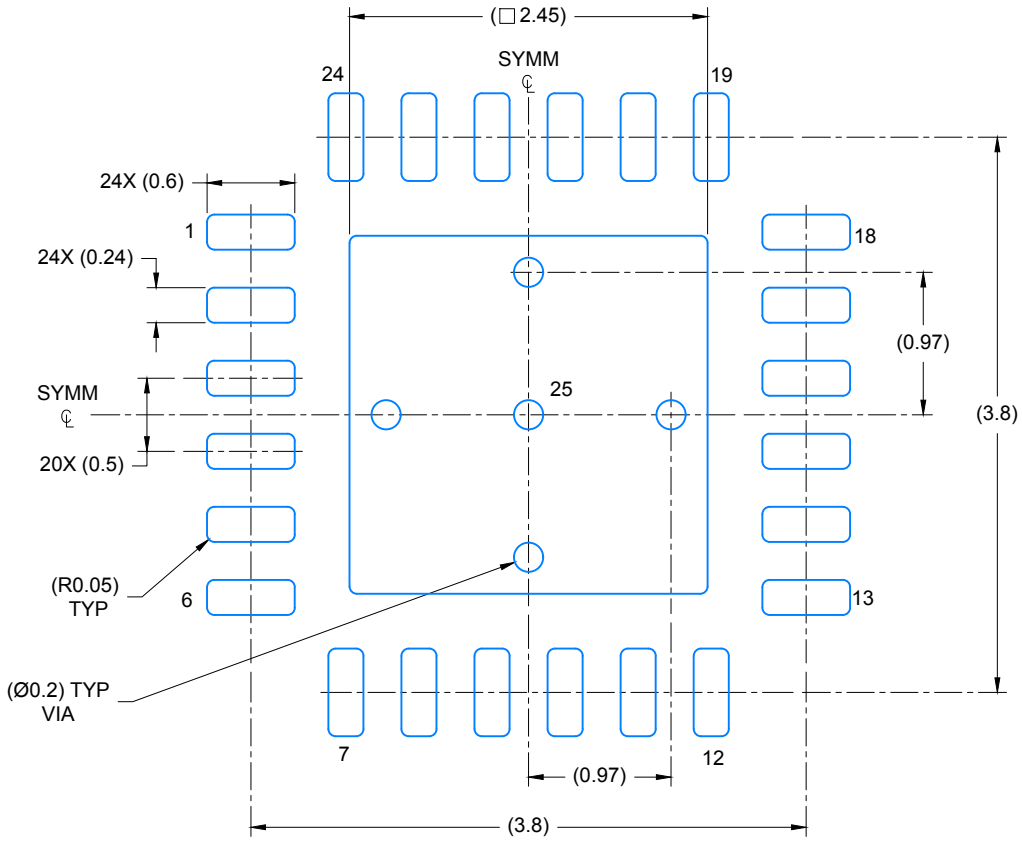
WQFN - 0.8 mm max height

PLASTIC QUAD FLATPACK-NO LEAD

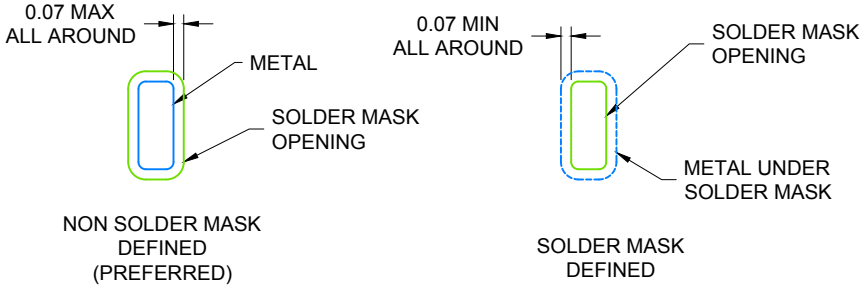


NOTES:

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

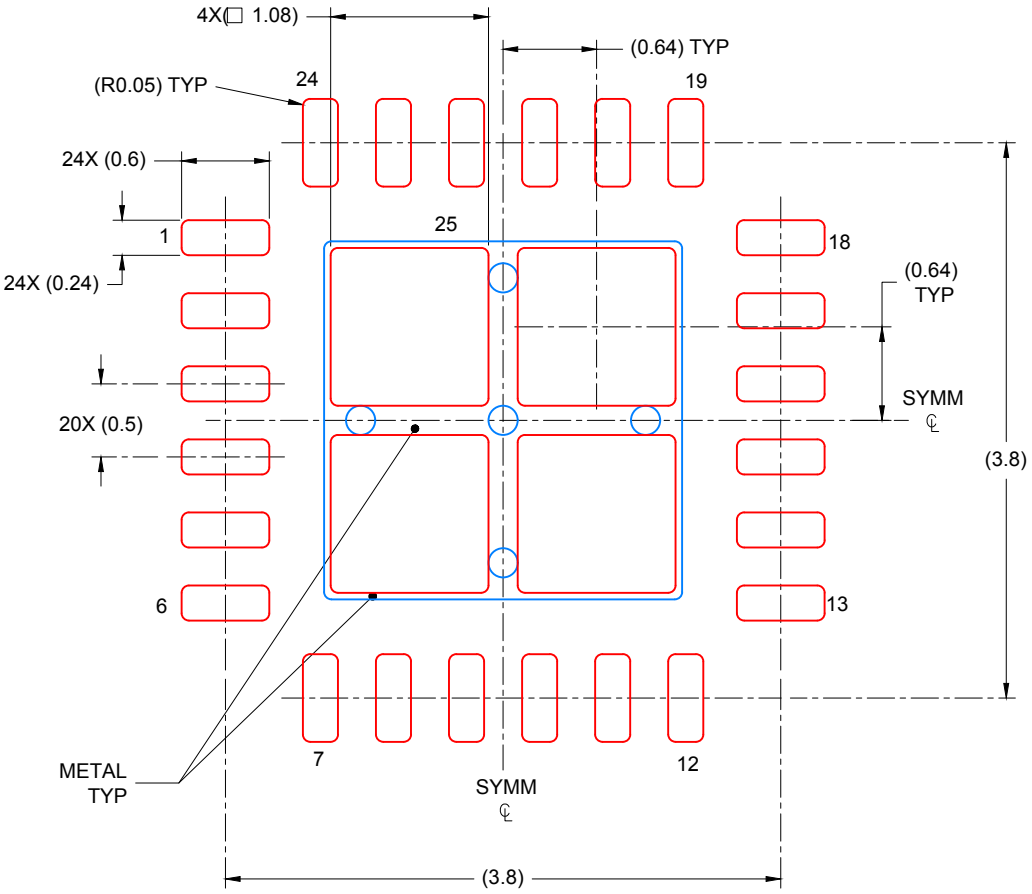


SOLDER MASK DETAILS

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.

重要なお知らせと免責事項

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