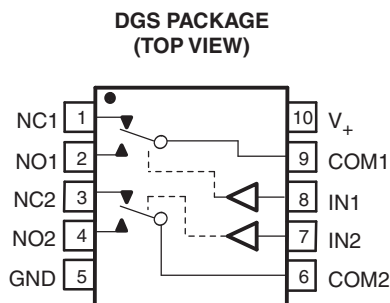
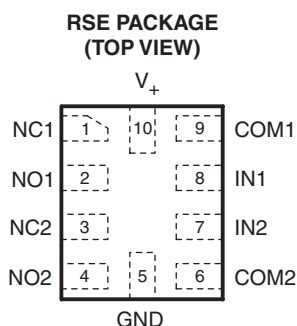


FEATURES

- Specified Break-Before-Make Switching
- Low ON-State Resistance (0.65 Ω Max)
- Low Charge Injection
- Excellent ON-State Resistance Matching
- Low Total Harmonic Distortion (THD)
- 1.65-V to 3.6-V Single-Supply Operation
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Performance Tested Per JESD 22
 - 2000-V Human-Body Model (A114-B, Class II)
 - 1000-V Charged-Device Model (C101)

APPLICATIONS

- Cell Phones
- PDAs
- Portable Instrumentation
- Audio and Video Signal Routing
- Low-Voltage Data Acquisition Systems
- Communication Circuits
- Modems
- Hard Drives
- Computer Peripherals
- Wireless Terminals and Peripherals



DESCRIPTION/ORDERING INFORMATION

The TS3A24157 is a dual single-pole double-throw (SPDT) analog switch that is designed to operate from 1.4 V to 3.6 V. The device offers low ON-state resistance and excellent ON-state resistance matching with the break-before-make feature, to prevent signal distortion during the transfer of a signal from one channel to another. The device has excellent total harmonic distortion (THD) performance and consumes very low power. These features make this device suitable for portable audio applications.

ORDERING INFORMATION

T _A	PACKAGE ⁽¹⁾⁽²⁾		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	QFN – RSE	Tape and reel	TS3A24157RSER	JZ0
	VSSOP – DGS (MSOP)	Tape and reel	TS3A24157DGSR	JZ0

(1) Package drawings, thermal data, and symbolization are available at www.ti.com/packaging.

(2) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.

FUNCTION TABLE

IN	NC TO COM, COM TO NC	NO TO COM, COM TO NO
L	ON	OFF
H	OFF	ON



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

TS3A24157
0.65-Ω DUAL SPDT ANALOG SWITCH
DUAL-CHANNEL 2:1 MULTIPLEXER/DEMULTIPLEXER

SCDS208A–JUNE 2007–REVISED SEPTEMBER 2007

SUMMARY OF CHARACTERISTICS

$V_+ = 3\text{ V}$, $T_A = 25^\circ\text{C}$

Configuration	Dual 2:1 Multiplexer/ Demultiplexer (2× SPDT)
Number of channels	2
ON-state resistance (r_{on})	0.65 Ω max
ON-state resistance match (Δr_{on})	0.07 Ω max
ON-state resistance flatness ($r_{on(flat)}$)	0.04 Ω max
Turn-on/turn-off time (t_{ON}/t_{OFF})	35 ns/25 ns
Break-before-make time (t_{BBM})	25 ns
Charge injection (Q_C)	8.75 pC
Bandwidth (BW)	50 MHz
OFF isolation (O_{ISO})	−72 dB
Crosstalk (X_{TALK})	−72 dB
Total harmonic distortion (THD)	0.005%
Power-supply current (I_+)	15 nA
Package options	10-pin QFN, 10-pin VSSOP

Absolute Maximum Ratings⁽¹⁾⁽²⁾

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

		MIN	MAX	UNIT
V_+	Supply voltage range ⁽³⁾	−0.5	3.6	V
V_{NC} V_{NO} V_{COM}	Analog voltage range ⁽³⁾⁽⁴⁾⁽⁵⁾	−0.5	$V_+ + 0.5$	V
$I_{I/O}$	Analog port diode current	$V_{NC}, V_{NO}, V_{COM} < 0$		−50 50
I_{NC}	ON-state switch current	$V_{NC}, V_{NO}, V_{COM} = 0 \text{ to } V_+$		−300 300
I_{NO} I_{COM}	ON-state peak switch current ⁽⁶⁾			−500 500
V_I	Digital input voltage range	−0.5	3.6	V
I_{IK}	Digital input clamp current ⁽³⁾⁽⁴⁾	$V_I < 0$		−50
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, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. 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) The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
- (5) This value is limited to 5.5 V maximum.
- (6) Pulse at 1-ms duration <10% duty cycle.

Package Thermal Impedance

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

		TYP	UNIT
θ_{JA}	Package thermal impedance ⁽¹⁾	DGS package	165
		RSE package	243

- (1) The package thermal impedance is calculated in accordance with JESD 51-7.

Electrical Characteristics for 3-V Supply⁽¹⁾

$V_+ = 2.7 \text{ V to } 3.6 \text{ V}$, $T_A = -40^\circ\text{C to } 85^\circ\text{C}$ (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	T_A	V_+	MIN	TYP	MAX	UNIT
Analog Switch								
Analog signal range	V_{COM}, V_{NO}, V_{NC}				0		V_+	V
Peak ON resistance	r_{peak}	$0 \leq (V_{NO} \text{ or } V_{NC}) \leq V_+$, $I_{COM} = -100 \text{ mA}$, Switch ON, See Figure 10	25°C Full	2.7 V		0.5 0.75	0.65	Ω
ON-state resistance	r_{on}	$V_{NO} \text{ or } V_{NC} = 2 \text{ V}$, $I_{COM} = -100 \text{ mA}$, Switch ON, See Figure 10	25°C Full	2.7 V		0.45 0.65	0.6	Ω
ON-state resistance match between channels	Δr_{on}	$V_{NO} \text{ or } V_{NC} = 2 \text{ V}, 0.8 \text{ V}$, $I_{COM} = -100 \text{ mA}$, Switch ON, See Figure 10	25°C Full	2.7 V		0.05 0.08	0.07	Ω
ON-state resistance flatness	$r_{on(flat)}$	$0 \leq (V_{NO} \text{ or } V_{NC}) \leq V_+$, $I_{COM} = -100 \text{ mA}$, $V_{NO} \text{ or } V_{NC} = 2 \text{ V}, 0.8 \text{ V}$, $I_{COM} = -100 \text{ mA}$, Switch ON, See Figure 10	25°C Full	2.7 V		0.025 0.01 0.1	0.04	Ω
NC, NO OFF leakage current	$I_{NC(OFF)}, I_{NO(OFF)}$	$V_{NC} \text{ or } V_{NO} = 1 \text{ V}, V_{COM} = 3 \text{ V}$, or $V_{NC} \text{ or } V_{NO} = 3 \text{ V}, V_{COM} = 1 \text{ V}$, Switch OFF, See Figure 11	25°C Full	3.6 V	-50 -250		50 250	nA
NC, NO ON leakage current	$I_{NC(ON)}, I_{NO(ON)}$	$V_{NC} \text{ or } V_{NO} = 1 \text{ V}, V_{COM} = \text{Open}$, or $V_{NC} \text{ or } V_{NO} = 3 \text{ V}, V_{COM} = \text{Open}$, Switch ON, See Figure 12	25°C Full	3.6 V	-50 -400		50 400	nA
COM ON leakage current	$I_{COM(ON)}$	$V_{NC} \text{ or } V_{NO} = \text{Open}, V_{COM} = 1 \text{ V}$, or $V_{NC} \text{ or } V_{NO} = \text{Open}, V_{COM} = 3 \text{ V}$, Switch ON, See Figure 12	25°C Full	3.6 V	-50 -400		50 400	nA
Digital Control Inputs (IN1, IN2)⁽²⁾								
Input logic high	V_{IH}		Full		1.4			V
Input logic low	V_{IL}		Full				0.5	V
Input leakage current	I_{IH}, I_{IL}	$V_I = 3.6 \text{ V or } 0$	25°C Full	3.6 V	-50 -150	5	50 150	nA

(1) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum

(2) 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.

TS3A24157
0.65-Ω DUAL SPDT ANALOG SWITCH
DUAL-CHANNEL 2:1 MULTIPLEXER/DEMULTIPLEXER

SCDS208A–JUNE 2007–REVISED SEPTEMBER 2007

Electrical Characteristics for 3-V Supply⁽¹⁾ (Continued)

$V_+ = 2.7 \text{ V to } 3.6 \text{ V}$, $T_A = -40^\circ\text{C to } 85^\circ\text{C}$ (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS	T_A	V_+	MIN	TYP	MAX	UNIT
Dynamic								
Turn-on time	t_{ON}	$V_{COM} = V_+$, $R_L = 50 \Omega$, $C_L = 35 \text{ pF}$, See Figure 14	25°C	3 V	20	35		ns
			Full	2.7 V to 3.6 V		40		
Turn-off time	t_{OFF}	$V_{COM} = V_+$, $R_L = 50 \Omega$, $C_L = 35 \text{ pF}$, See Figure 14	25°C	3 V	12	25		ns
			Full	2.7 V to 3.6 V		30		
Break-before-make time	t_{BBM}	$V_{NC} = V_{NO} = V_+$, $R_L = 50 \Omega$, $C_L = 35 \text{ pF}$, See Figure 15	25°C	3 V	1	10	25	ns
			Full	2.7 V to 3.6 V	0.5		30	
Charge injection	Q_C	$V_{GEN} = 0$, $R_{GEN} = 0$, $C_L = 1 \text{ nF}$, See Figure 19	25°C	3 V		8.75		pC
NC, NO OFF capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$	V_{NC} or $V_{NO} = V_+$ or GND, Switch OFF, See Figure 13	25°C	3 V		50		pF
NC, NO ON capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$	V_{NC} or $V_{NO} = V_+$ or GND, Switch ON, See Figure 13	25°C	3 V		140		pF
COM ON capacitance	$C_{COM(ON)}$	$V_{COM} = V_+$ or GND, Switch ON, See Figure 13	25°C	3 V		140		pF
Digital input capacitance	C_I	$V_I = V_+$ or GND, See Figure 13	25°C	3 V		2		pF
Bandwidth	BW	$R_L = 50 \Omega$, Switch ON, See Figure 16	25°C	3 V		50		MHz
OFF isolation	O_{ISO}	$R_L = 50 \Omega$, $f = 1 \text{ MHz}$, See Figure 17	25°C	3 V		–72		dB
Crosstalk	X_{TALK}	$R_L = 50 \Omega$, $f = 1 \text{ MHz}$, See Figure 18	25°C	3 V		–72		dB
Total harmonic distortion	THD	$R_L = 600 \Omega$, $C_L = 50 \text{ pF}$, $f = 20 \text{ Hz to } 20 \text{ kHz}$, See Figure 20	25°C	3 V		0.005		%
Supply								
Positive supply current	I_+	$V_I = V_+$ or GND	25°C	3.6 V	15	200		nA
			Full			1200		

(1) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum

Electrical Characteristics for 2.5-V Supply⁽¹⁾

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

PARAMETER	SYMBOL	TEST CONDITIONS		T _A	V ₊	MIN	TYP	MAX	UNIT
Analog Switch									
Analog signal range	V _{COM} , V _{NO} , V _{NC}					0		V ₊	V
Peak ON resistance	r _{peak}	0 ≤ (V _{NO} or V _{NC}) ≤ V ₊ , I _{COM} = −8 mA,	Switch ON, See Figure 10	25°C Full	2.3 V	0.55	0.75	0.9	Ω
ON-state resistance	r _{on}	V _{NO} or V _{NC} = 1.8 V, I _{COM} = −8 mA,	Switch ON, See Figure 10	25°C Full	2.3 V	0.56	0.75	0.85	Ω
ON-state resistance match between channels	Δr _{on}	V _{NO} or V _{NC} = 1.8 V, 0.8 V, I _{COM} = −8 mA,	Switch ON, See Figure 10	25°C Full	2.3 V	0.1	0.15	0.15	Ω
ON-state resistance flatness	r _{on(flat)}	0 ≤ (V _{NO} or V _{NC}) ≤ V ₊ , I _{COM} = −8 mA,	Switch ON, See Figure 10	25°C	2.3 V	0.1	0.15		Ω
		V _{NO} or V _{NC} = 0.8 V, 1.8 V, I _{COM} = −8 mA,	Switch ON, See Figure 10	25°C			0.17		
				Full			0.2		
NC, NO OFF leakage current	I _{NC(OFF)} , I _{NO(OFF)}	V _{NC} or V _{NO} = 0.5 V, V _{COM} = 2.2 V, or V _{NC} or V _{NO} = 2.2 V, V _{COM} = 0.5 V,	Switch OFF, See Figure 11	25°C Full	2.7 V	−50		50	nA
						−250		250	
NC, NO ON leakage current	I _{NC(ON)} , I _{NO(ON)}	V _{NC} or V _{NO} = 0.5 V, V _{COM} = Open, or V _{NC} or V _{NO} = 2.2 V, V _{COM} = Open,	Switch ON, See Figure 12	25°C Full	2.7 V	−50		50	nA
						−400		400	
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} = 2.2 V,	Switch ON, See Figure 12	25°C Full	2.7 V	−50		50	nA
						−400		400	
Digital Control Inputs (IN1, IN2) ⁽²⁾									
Input logic high	V _{IH}			Full		1.25			V
Input logic low	V _{IL}			Full				0.5	V
Input leakage current	I _{IH} , I _{IL}	V _I = 2.7 V or 0		25°C Full	2.7 V	−50		50	nA
						−50		50	

(1) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum

(2) 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.

TS3A24157
0.65-Ω DUAL SPDT ANALOG SWITCH
DUAL-CHANNEL 2:1 MULTIPLEXER/DEMULTIPLEXER

SCDS208A–JUNE 2007–REVISED SEPTEMBER 2007

Electrical Characteristics for 2.5-V Supply⁽¹⁾ (Continued)

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

PARAMETER	SYMBOL	TEST CONDITIONS	T_A	V_+	MIN	TYP	MAX	UNIT
Dynamic								
Turn-on time	t_{ON}	$V_{COM} = V_+$, $R_L = 50 \Omega$, $C_L = 35 \text{ pF}$, See Figure 14	25°C	2.5 V		23	45	ns
			Full	2.3 V to 2.7 V			50	
Turn-off time	t_{OFF}	$V_{COM} = V_+$, $R_L = 50 \Omega$, $C_L = 35 \text{ pF}$, See Figure 14	25°C	2.5 V		17	27	ns
			Full	2.3 V to 2.7 V			30	
Break-before-make time	t_{BBM}	$V_{NC} = V_{NO} = V_+$, $R_L = 50 \Omega$, $C_L = 35 \text{ pF}$, See Figure 15	25°C	2.5 V	2	14	30	ns
			Full	2.3 V to 2.7 V	1		35	
Charge injection	Q_C	$V_{GEN} = 0$, $R_{GEN} = 0$, $C_L = 1 \text{ nF}$, See Figure 19	25°C	2.5 V		8		pC
NC, NO OFF capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$	V_{NC} or $V_{NO} = V_+$ or GND, Switch OFF, See Figure 13	25°C	2.5 V		50		pF
NC, NO ON capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$	V_{NC} or $V_{NO} = V_+$ or GND, Switch ON, See Figure 13	25°C	2.5 V		140		pF
COM ON capacitance	$C_{COM(ON)}$	$V_{COM} = V_+$ or GND, Switch ON, See Figure 13	25°C	2.5 V		140		pF
Digital input capacitance	C_I	$V_I = V_+$ or GND, See Figure 13	25°C	2.5 V		2		pF
Bandwidth	BW	$R_L = 50 \Omega$, Switch ON, See Figure 16	25°C	2.5 V		50		MHz
OFF isolation	O_{ISO}	$R_L = 50 \Omega$, $f = 1 \text{ MHz}$, See Figure 17	25°C	2.5 V		–72		dB
Crosstalk	X_{TALK}	$R_L = 50 \Omega$, $f = 1 \text{ MHz}$, See Figure 18	25°C	2.5 V		–72		dB
Total harmonic distortion	THD	$R_L = 600 \Omega$, $C_L = 50 \text{ pF}$, $f = 20 \text{ Hz to } 20 \text{ kHz}$, See Figure 20	25°C	2.5 V		0.006		%
Supply								
Positive supply current	I_+	$V_I = V_+$ or GND	25°C	2.7 V		10	150	nA
			Full				700	

(1) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum

Electrical Characteristics for 1.8-V Supply⁽¹⁾

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

PARAMETER	SYMBOL	TEST CONDITIONS	T_A	V_+	MIN	TYP	MAX	UNIT
Analog Switch								
Analog signal range	$V_{\text{COM}}, V_{\text{NO}}, V_{\text{NC}}$				0		V_+	V
Peak ON resistance	r_{peak}	$0 \leq (V_{\text{NO}} \text{ or } V_{\text{NC}}) \leq V_+$, $I_{\text{COM}} = -2\text{ mA}$, Switch ON, See Figure 10	25°C Full	1.65 V	0.8		1.25 1.4	Ω
ON-state resistance	r_{on}	$V_{\text{NO}} \text{ or } V_{\text{NC}} = 1.5\text{ V}$, $I_{\text{COM}} = -2\text{ mA}$, Switch ON, See Figure 10	25°C Full	1.65 V	0.6		0.95 1	Ω
ON-state resistance match between channels	Δr_{on}	$V_{\text{NO}} \text{ or } V_{\text{NC}} = 0.6\text{ V}, 1.5\text{ V}$, $I_{\text{COM}} = -2\text{ mA}$, Switch ON, See Figure 10	25°C Full	1.65 V	0.1		0.15 0.15	Ω
ON-state resistance flatness	$r_{\text{on(flat)}}$	$0 \leq (V_{\text{NO}} \text{ or } V_{\text{NC}}) \leq V_+$, $I_{\text{COM}} = -2\text{ mA}$, Switch ON, See Figure 10	25°C Full	1.65 V	0.35		0.13 0.2	Ω
NC, NO OFF leakage current	$I_{\text{NC(OFF)}}, I_{\text{NO(OFF)}}$	$V_{\text{NC}} \text{ or } V_{\text{NO}} = 0.3\text{ V}, V_{\text{COM}} = 1.65\text{ V}$, or $V_{\text{NC}} \text{ or } V_{\text{NO}} = 1.65\text{ V}, V_{\text{COM}} = 0.3\text{ V}$, Switch OFF, See Figure 11	25°C Full	1.65	-50		50 250	nA
NC, NO ON leakage current	$I_{\text{NC(ON)}}, I_{\text{NO(ON)}}$	$V_{\text{NC}} \text{ or } V_{\text{NO}} = 0.3\text{ V}, V_{\text{COM}} = \text{Open}$, or $V_{\text{NC}} \text{ or } V_{\text{NO}} = 1.65\text{ V}, V_{\text{COM}} = \text{Open}$, Switch ON, See Figure 12	25°C Full	1.95 V	-50		50 400	nA
COM ON leakage current	$I_{\text{COM(ON)}}$	$V_{\text{NC}} \text{ or } V_{\text{NO}} = \text{Open}, V_{\text{COM}} = 0.3\text{ V}$, or $V_{\text{NC}} \text{ or } V_{\text{NO}} = \text{Open}, V_{\text{COM}} = 1.65\text{ V}$, Switch ON, See Figure 12	25°C Full	1.95 V	-50		50 400	nA
Digital Control Inputs (IN1, IN2)⁽²⁾								
Input logic high	V_{IH}		Full		1			V
Input logic low	V_{IL}		Full				0.4	V
Input leakage current	$I_{\text{IH}}, I_{\text{IL}}$	$V_{\text{I}} = 1.95\text{ V}$ or 0	25°C Full	1.95 V	0		50 150	nA

(1) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum

(2) 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.

TS3A24157
0.65-Ω DUAL SPDT ANALOG SWITCH
DUAL-CHANNEL 2:1 MULTIPLEXER/DEMULTIPLEXER

SCDS208A—JUNE 2007—REVISED SEPTEMBER 2007

Electrical Characteristics for 1.8-V Supply⁽¹⁾ (Continued)

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

PARAMETER	SYMBOL	TEST CONDITIONS	T_A	V_+	MIN	TYP	MAX	UNIT
Dynamic								
Turn-on time	t_{ON}	$V_{COM} = V_+$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, See Figure 14	25°C	1.8 V	33	75		ns
			Full	1.65 V to 1.95 V		80		
Turn-off time	t_{OFF}	$V_{COM} = V_+$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, See Figure 14	25°C	1.8 V	24	35		ns
			Full	1.65 V to 1.95 V		40		
Break-before-make time	t_{BBM}	$V_{NC} = V_{NO} = V_+$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, See Figure 15	25°C	1.8 V	2	20	40	ns
			Full	1.65 V to 1.95 V	1		50	
Charge injection	Q_C	$V_{GEN} = 0$, $R_{GEN} = 0$, $C_L = 1\text{ nF}$, See Figure 19	25°C	1.8 V		4		pC
NC, NO OFF capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$	V_{NC} or $V_{NO} = V_+$ or GND, Switch OFF, See Figure 13	25°C	1.8 V		50		pF
NC, NO ON capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$	V_{NC} or $V_{NO} = V_+$ or GND, Switch ON, See Figure 13	25°C	1.8 V		140		pF
COM ON capacitance	$C_{COM(ON)}$	$V_{COM} = V_+$ or GND, Switch ON, See Figure 13	25°C	1.8 V		140		pF
Digital input capacitance	C_I	$V_I = V_+$ or GND, See Figure 13	25°C	1.8 V		2		pF
Bandwidth	BW	$R_L = 50\ \Omega$, Switch ON, See Figure 16	25°C	1.8 V		48		MHz
OFF isolation	O_{ISO}	$R_L = 50\ \Omega$, $f = 1\text{ MHz}$, See Figure 17	25°C	1.8 V		-73		dB
Crosstalk	X_{TALK}	$R_L = 50\ \Omega$, $f = 1\text{ MHz}$, See Figure 18	25°C	1.8 V		-72		dB
Total harmonic distortion	THD	$R_L = 600\ \Omega$, $C_L = 50\text{ pF}$, $f = 20\text{ Hz to }20\text{ kHz}$, See Figure 20	25°C	1.8 V				%
Supply								
Positive supply current	I_+	$V_I = V_+$ or GND	25°C	1.95 V	10	100		nA
			Full			600		

(1) The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum

TYPICAL PERFORMANCE

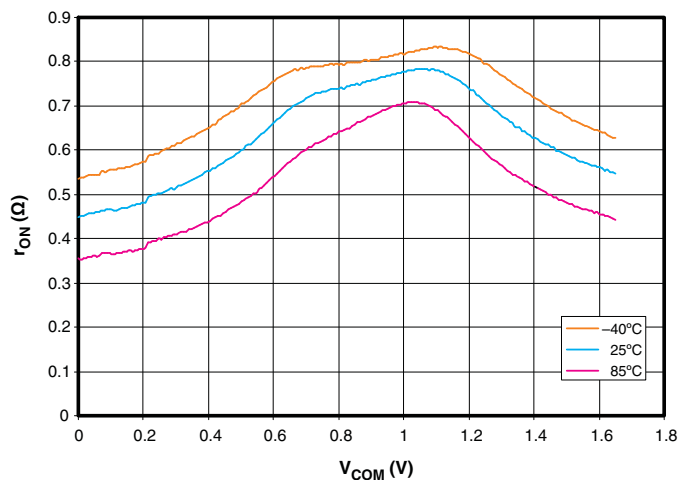


Figure 1. r_{ON} vs V_{COM} ($V_+ = 1.65$ V)

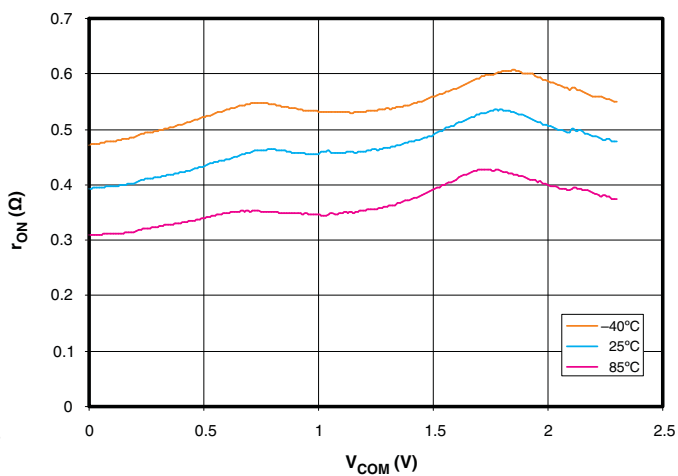


Figure 2. r_{ON} vs V_{COM} ($V_+ = 2.3$ V)

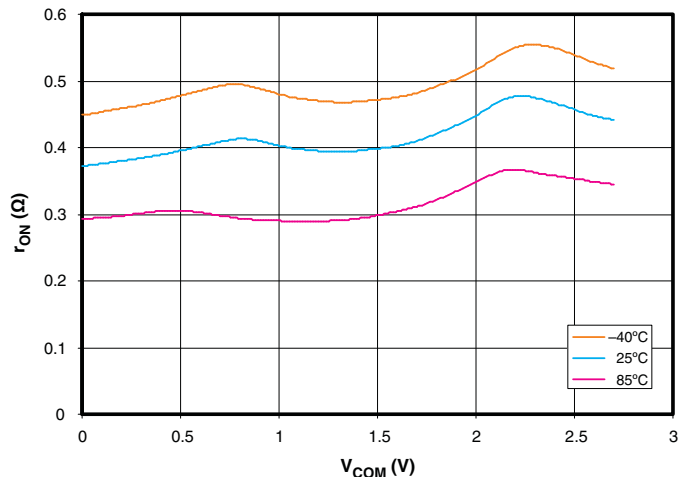


Figure 3. r_{ON} vs V_{COM} ($V_+ = 2.7$ V)

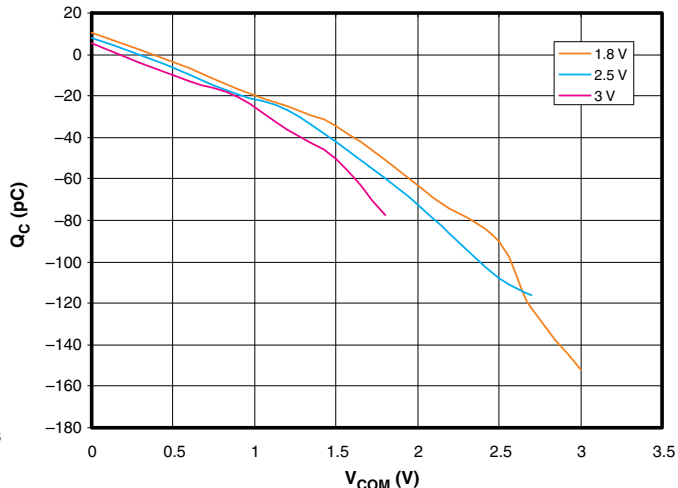


Figure 4. Charge Injection (Q_C) vs V_{COM}

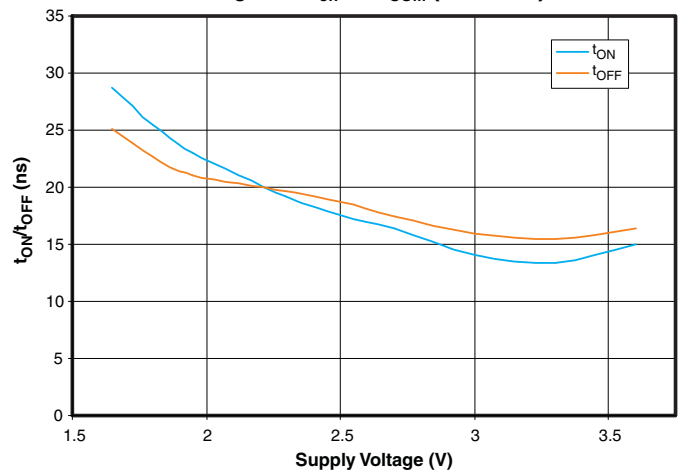


Figure 5. t_{ON} and t_{OFF} vs Supply Voltage

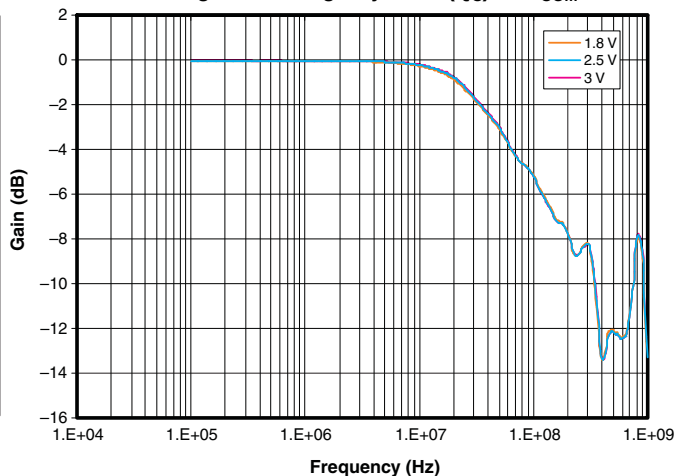


Figure 6. Bandwidth

TYPICAL PERFORMANCE (continued)

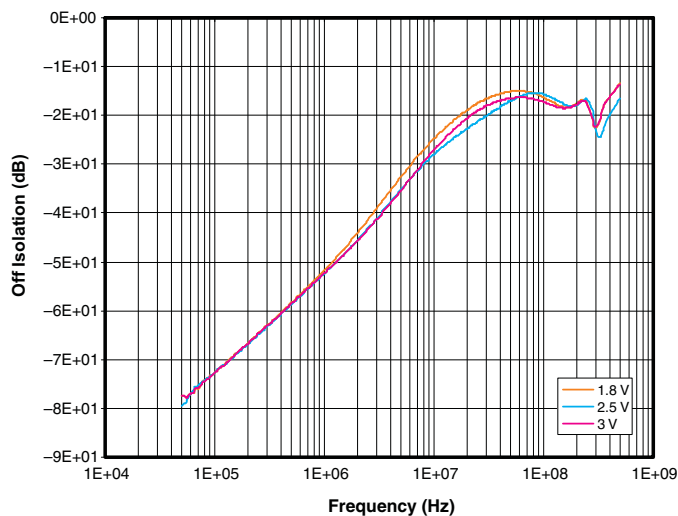


Figure 7. OFF Isolation and Crosstalk

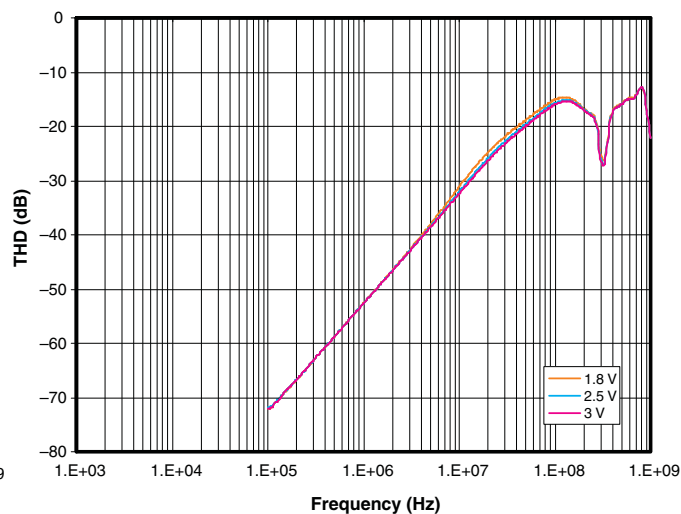


Figure 8. Total Harmonic Distortion vs Frequency

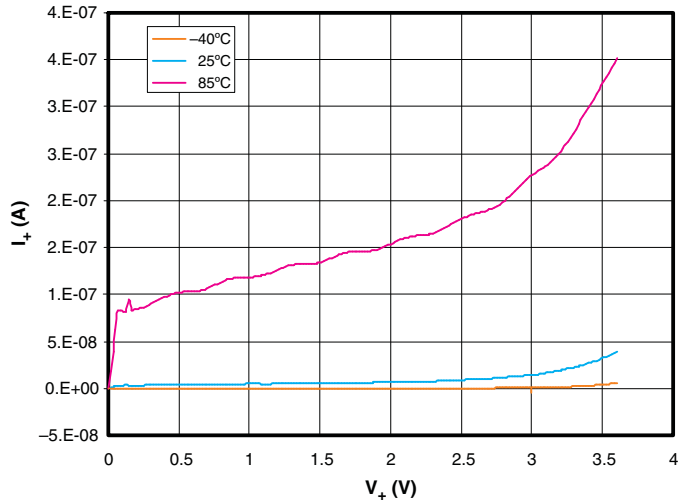


Figure 9. Power-Supply Current vs V_+

PIN DESCRIPTION

NO.	NAME	DESCRIPTION
1	NC1	Normally closed
2	NO1	Normally open
3	NC2	Normally closed
4	NO2	Normally open
5	GND	Ground
6	COM2	Common
7	IN2	Digital control to connect COM2 to NO2 or NC2
8	IN1	Digital control to connect COM1 to NO1 or NC1
9	COM1	Common
10	V ₊	Power supply

TS3A24157
0.65-Ω DUAL SPDT ANALOG SWITCH
DUAL-CHANNEL 2:1 MULTIPLEXER/DEMULTIPLEXER

SCDS208A—JUNE 2007—REVISED SEPTEMBER 2007

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 COM and NO ports when the channel is ON
r_{peak}	Peak on-state resistance over a specified voltage range
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 under worst-case input and output conditions
$I_{NC(PWROFF)}$	Leakage current measured at the NC port during the power-down condition, $V_+ = 0$
$I_{NO(OFF)}$	Leakage current measured at the NO port, with the corresponding channel (NO to COM) in the OFF state under worst-case input and output conditions
$I_{NO(PWROFF)}$	Leakage current measured at the NO port during the power-down condition, $V_+ = 0$
$I_{NC(ON)}$	Leakage current measured at the NC port, with the corresponding channel (NC to COM) in the ON state and the output (COM) open
$I_{NO(ON)}$	Leakage current measured at the NO port, with the corresponding channel (NO to COM) in the ON state and the output (COM) open
$I_{COM(ON)}$	Leakage current measured at the COM port, with the corresponding channel (COM to NO or COM to NC) in the ON state and the output (NC or NO) open
$I_{COM(PWROFF)}$	Leakage current measured at the COM port during the power-down condition, $V_+ = 0$
V_{IH}	Minimum input voltage for logic high for the control input (IN)
V_{IL}	Maximum input voltage for logic low for the control input (IN)
V_I	Voltage at the control input (IN)
I_{IH}, I_{IL}	Leakage current measured at the control input (IN)
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 (COM, 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 (COM, NC, or NO) signal when the switch is turning OFF.
t_{BBM}	Break-before-make time. This parameter is measured under the specified range of conditions and by the propagation delay between the output of two adjacent analog channels (NC and NO) when the control signal changes state.
Q_C	Charge injection is a measurement of unwanted signal coupling from the control (IN) input to the analog (NC, NO, or COM) 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
$C_{NO(OFF)}$	Capacitance at the NO port when the corresponding channel (NO to COM) is OFF
$C_{NC(ON)}$	Capacitance at the NC port when the corresponding channel (NC to COM) is ON
$C_{NO(ON)}$	Capacitance at the NO port when the corresponding channel (NO to COM) is ON
$C_{COM(ON)}$	Capacitance at the COM port when the corresponding channel (COM to NC or COM to NO) is ON
C_I	Capacitance of control input (IN)
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 or NO to COM) in the OFF state.
X_{TALK}	Crosstalk is a measurement of unwanted signal coupling from an ON channel to an OFF channel (NC to NO or NO to NC). 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

PARAMETER MEASUREMENT INFORMATION

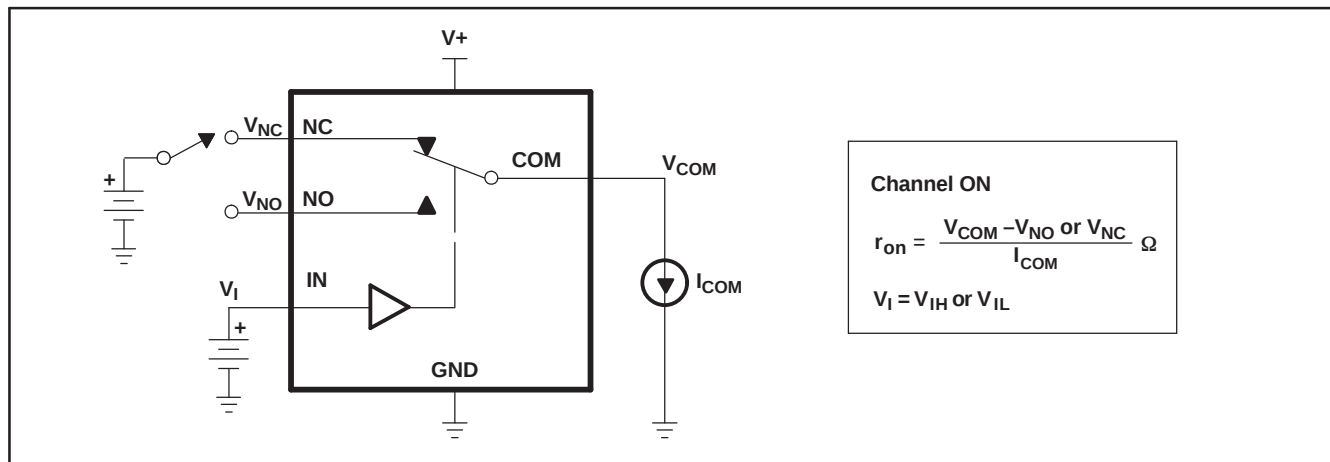


Figure 10. ON-State Resistance (r_{on})

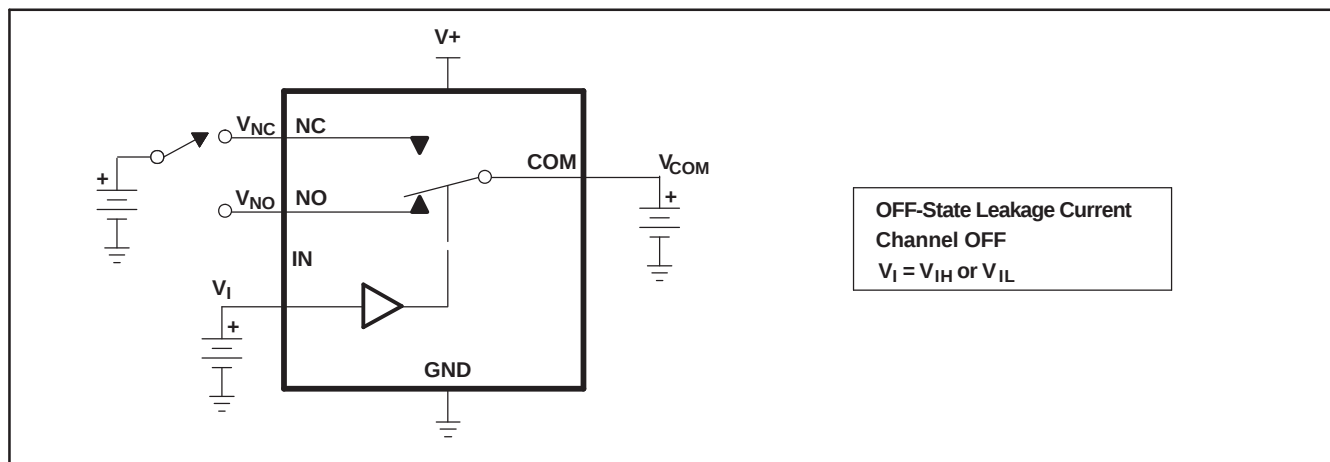


Figure 11. OFF-State Leakage Current
($I_{NC(OFF)}$, $I_{NC(PWROFF)}$, $I_{NO(OFF)}$, $I_{NO(PWROFF)}$, $I_{COM(OFF)}$, $I_{COM(PWROFF)}$)

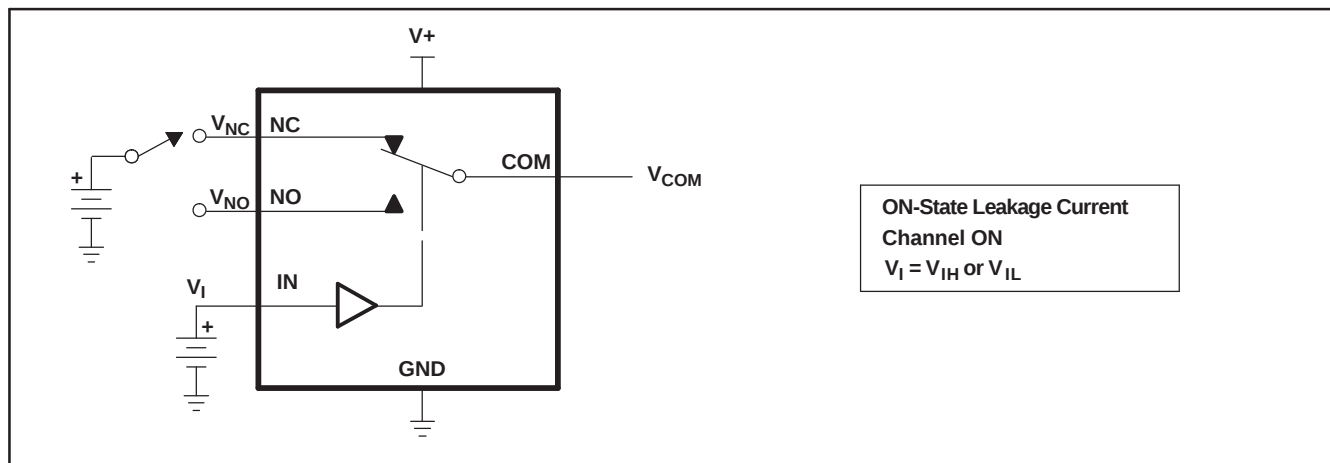


Figure 12. ON-State Leakage Current ($I_{COM(ON)}$, $I_{NC(ON)}$, $I_{NO(ON)}$)

PARAMETER MEASUREMENT INFORMATION (continued)

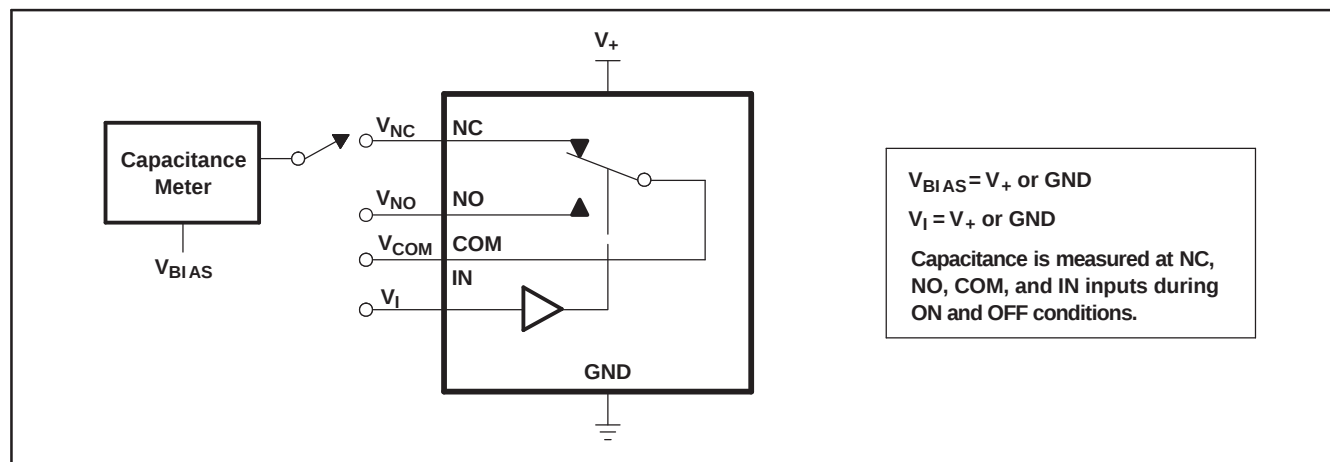
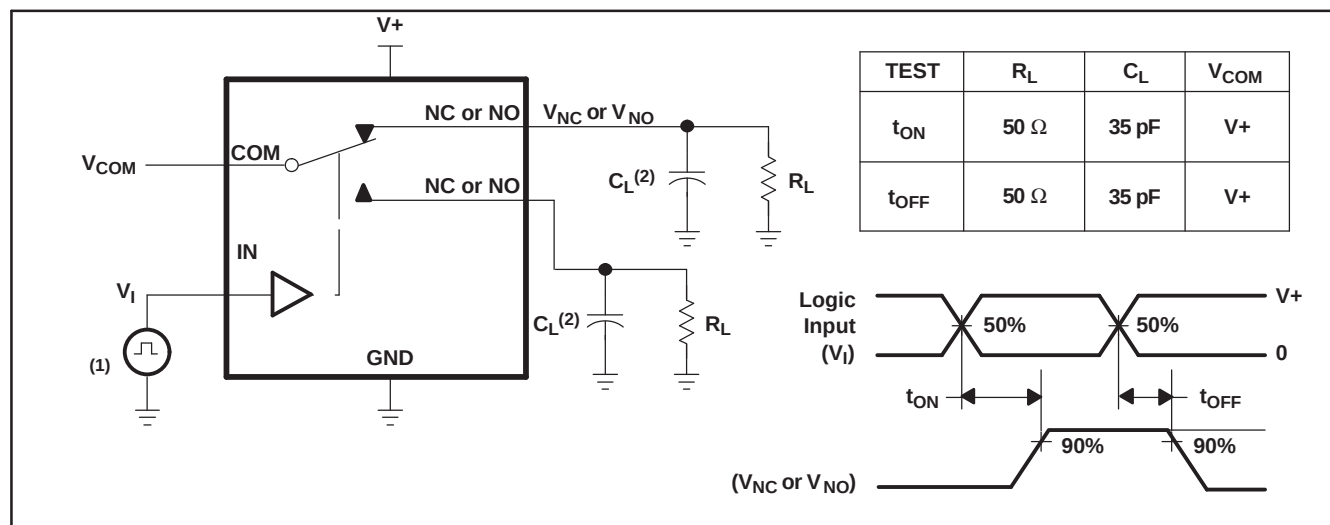


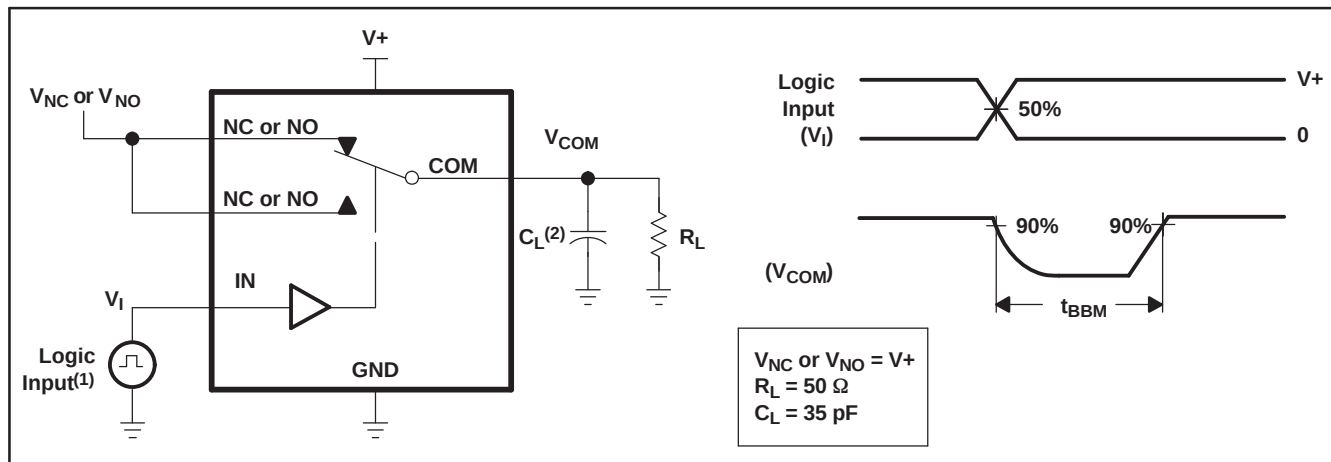
Figure 13. Capacitance (C_I , $C_{COM(ON)}$, $C_{NC(OFF)}$, $C_{NO(OFF)}$, $C_{NC(ON)}$, $C_{NO(ON)}$)



- A. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r < 5 \text{ ns}$, $t_f < 5 \text{ ns}$.
- B. C_L includes probe and jig capacitance.

Figure 14. Turn-On (t_{ON}) and Turn-Off Time (t_{OFF})

PARAMETER MEASUREMENT INFORMATION (continued)



- All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_O = 50 \Omega$, $t_r < 5 \text{ ns}$, $t_f < 5 \text{ ns}$.
- C_L includes probe and jig capacitance.

Figure 15. Break-Before-Make Time (t_{BBM})

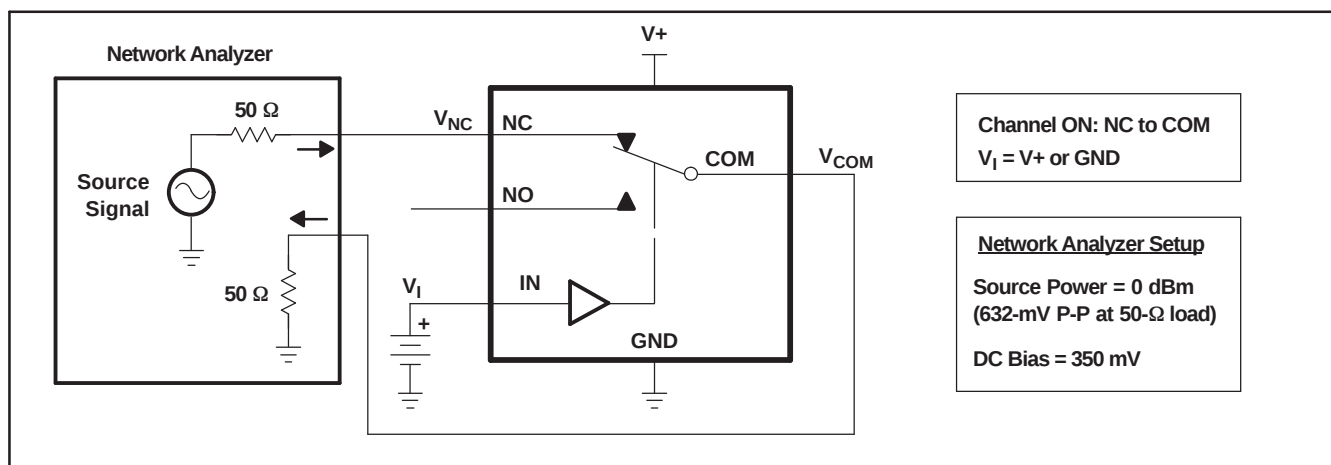


Figure 16. Bandwidth (BW)

PARAMETER MEASUREMENT INFORMATION (continued)

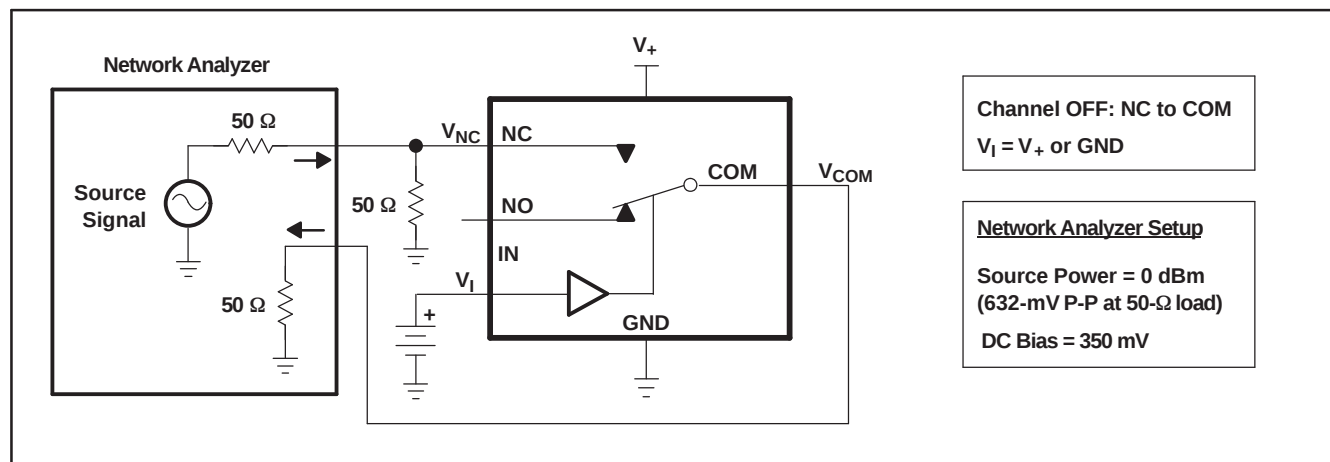


Figure 17. OFF Isolation (O_{ISO})

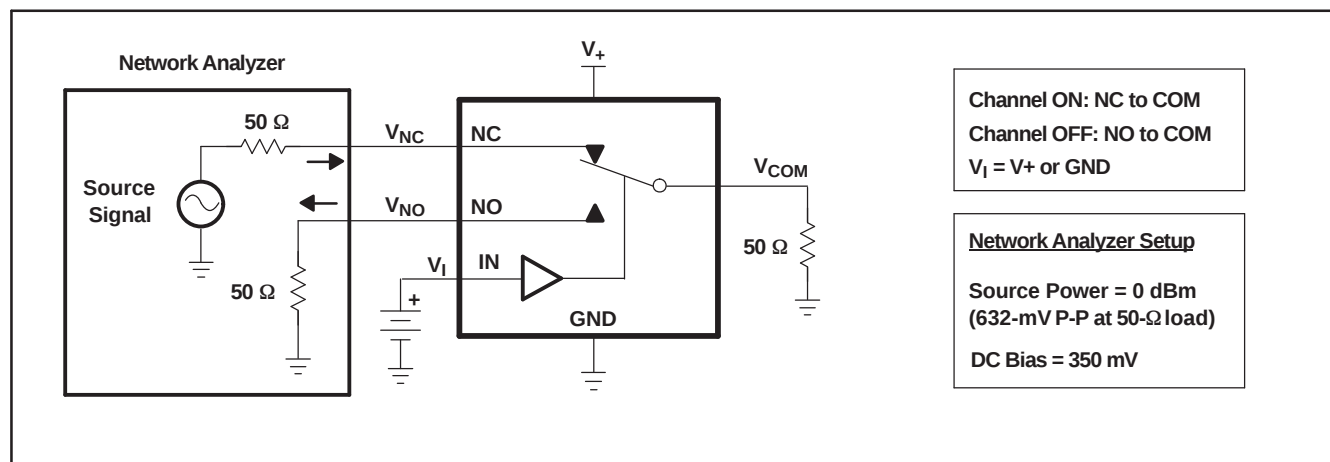
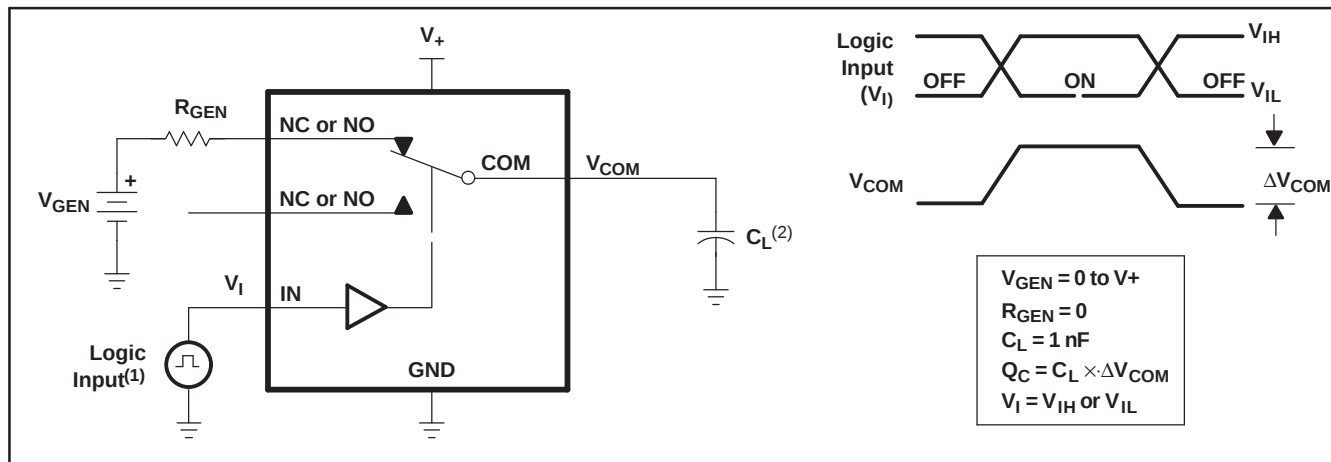


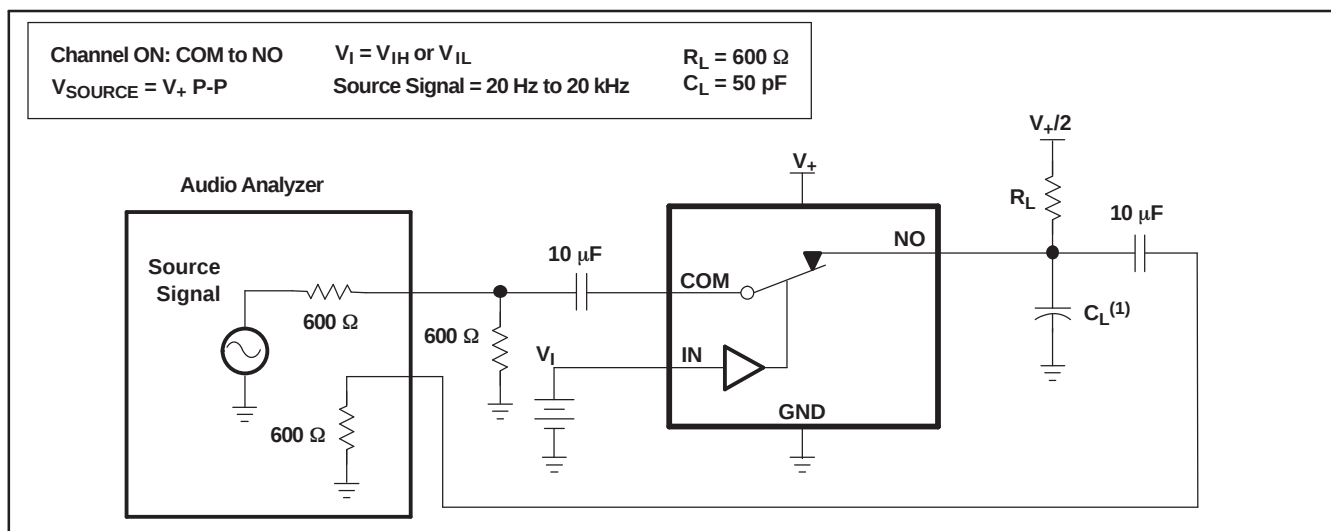
Figure 18. Crosstalk (X_{TALK})

PARAMETER MEASUREMENT INFORMATION (continued)



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

Figure 19. Charge Injection (Q_C)



- C_L includes probe and jig capacitance.

Figure 20. Total Harmonic Distortion (THD)

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
TS3A24157DGSR	ACTIVE	MSOP	DGS	10	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TS3A24157DGSRG4	ACTIVE	MSOP	DGS	10	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TS3A24157RSER	ACTIVE	QFN	RSE	10	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TS3A24157RSERG4	ACTIVE	QFN	RSE	10	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Pb-Free (RoHS Exempt): This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

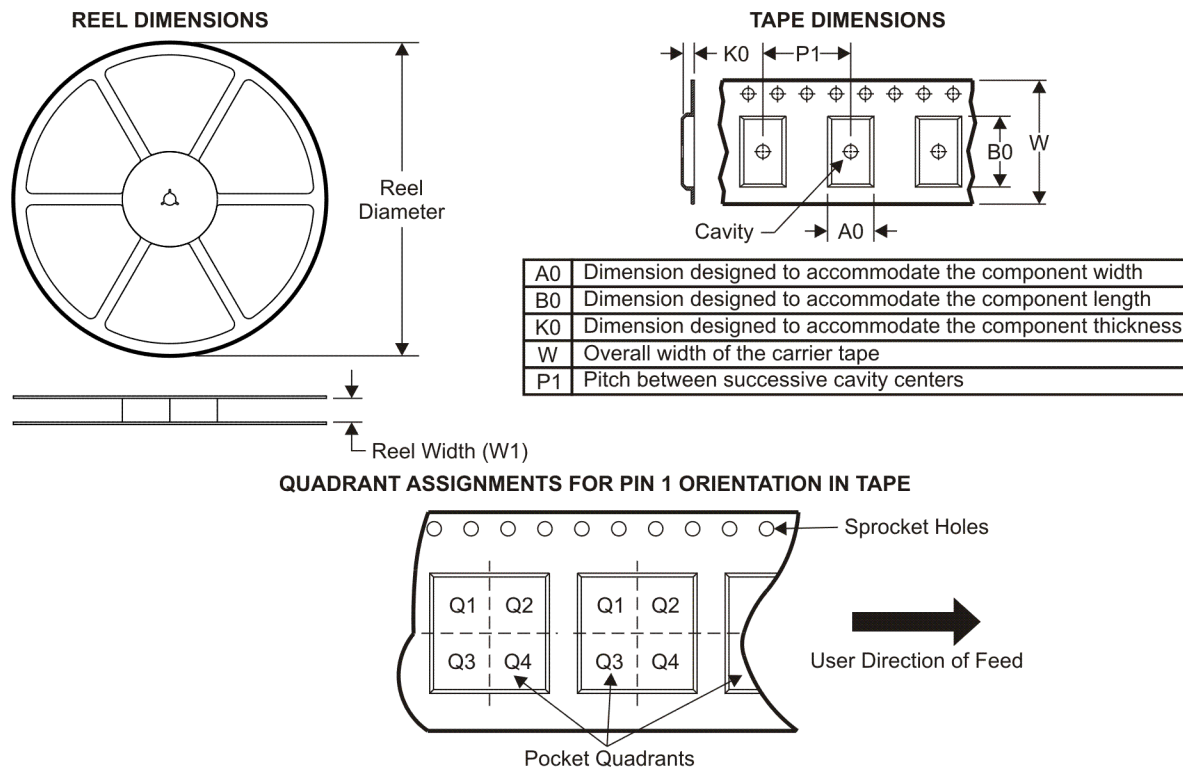
Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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.

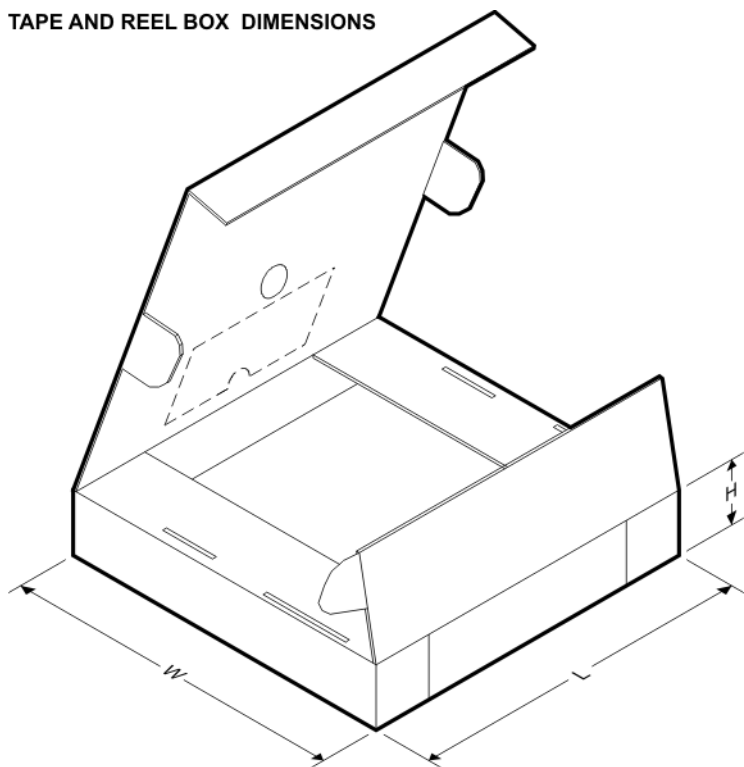
TAPE AND REEL INFORMATION



*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
TS3A24157DGSR	MSOP	DGS	10	2500	330.0	12.4	5.3	3.3	1.3	8.0	12.0	Q1
TS3A24157RSER	QFN	RSE	10	3000	179.0	8.4	1.75	2.25	0.65	4.0	8.0	Q1

TAPE AND REEL BOX DIMENSIONS

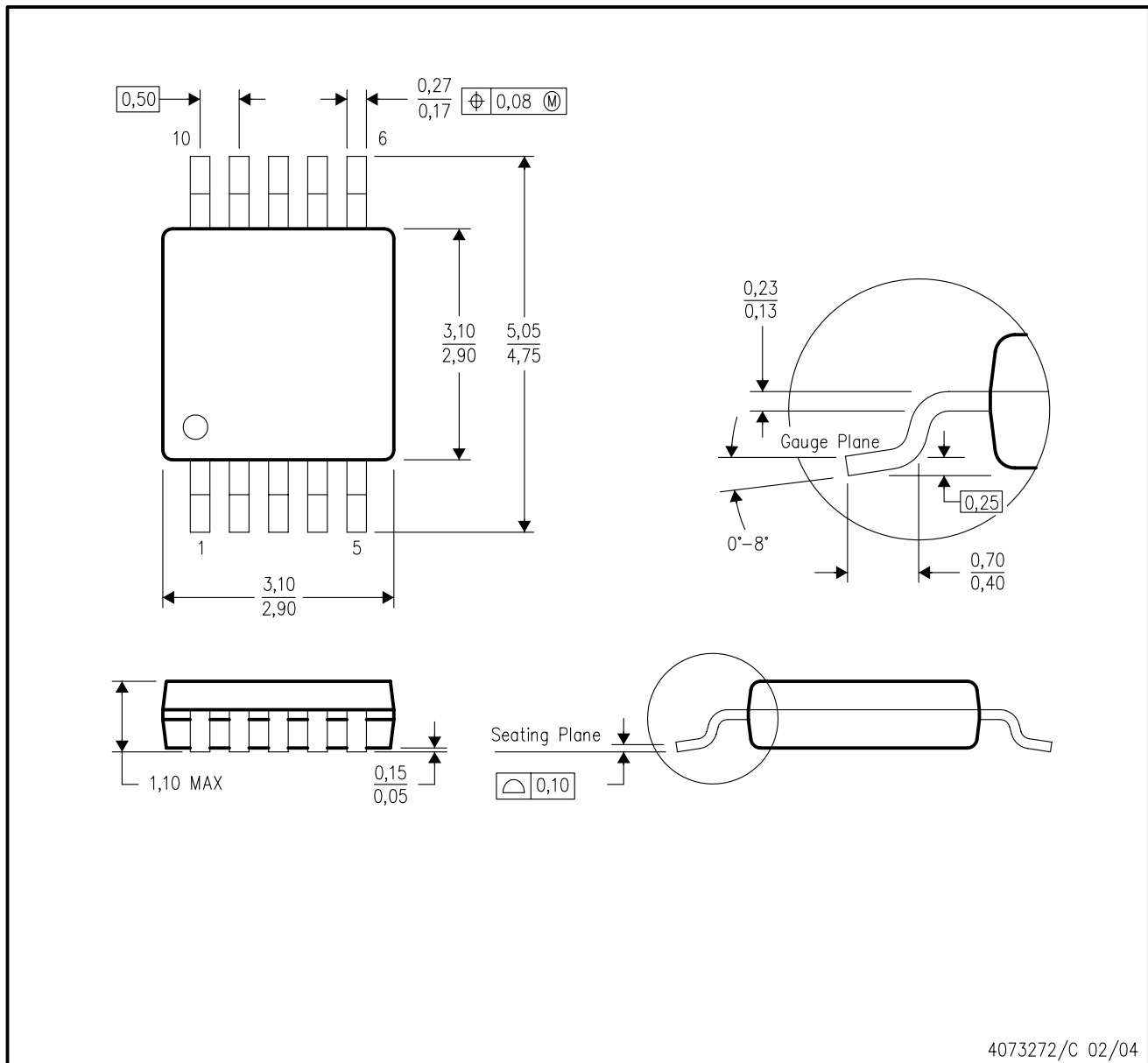


*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
TS3A24157DGSR	MSOP	DGS	10	2500	370.0	355.0	55.0
TS3A24157RSER	QFN	RSE	10	3000	220.0	205.0	50.0

DGS (S-PDSO-G10)

PLASTIC SMALL-OUTLINE PACKAGE

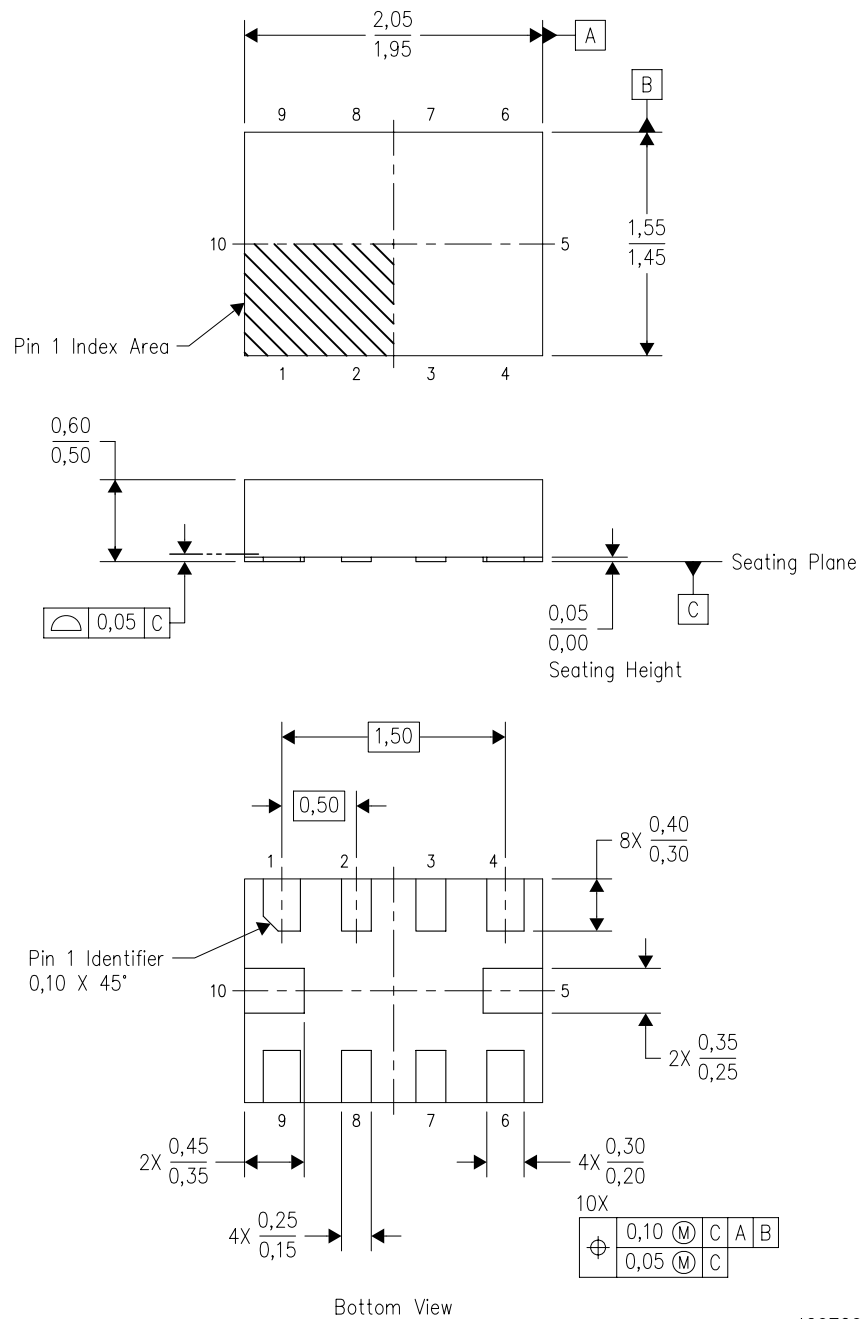


4073272/C 02/04

- NOTES:
- All linear dimensions are in millimeters.
 - This drawing is subject to change without notice.
 - Body dimensions do not include mold flash or protrusion.
 - Falls within JEDEC MO-187 variation BA.

RSE (R-PQFP-N10)

PLASTIC QUAD FLATPACK

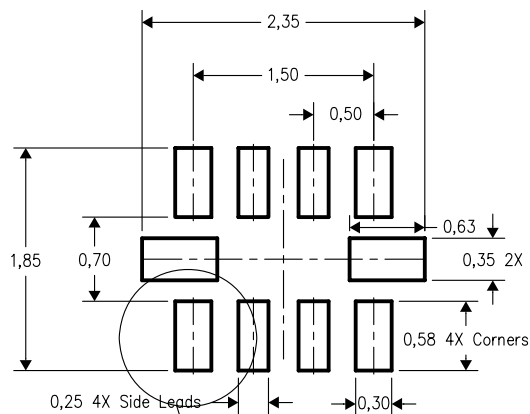


4207268-3/C 01/2008

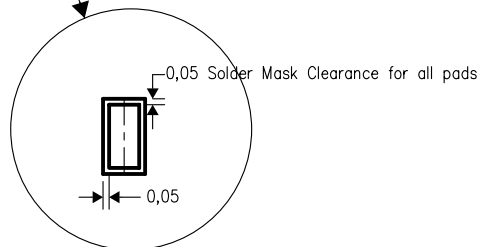
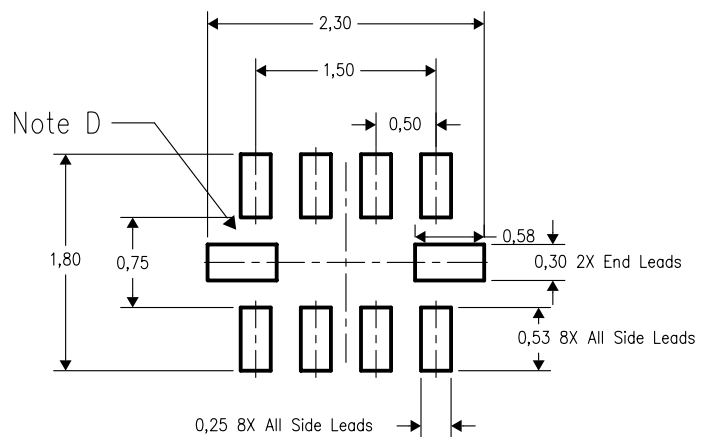
- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - B. This drawing is subject to change without notice.
 - C. QFN (Quad Flatpack No-Lead) package configuration.
 - D. This package complies to JEDEC MO-288 variation UEFD.

RSE (R-PQFP-N10)

Example Board Layout



Example Stencil Design
(Note E)



4208106-3/B 09/06

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Publication IPC-7351 is recommended for alternate designs.
 - D. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.
 - E. Maximum stencil thickness 0,127 mm (5 mils). All linear dimensions are in millimeters.
 - F. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC 7525 for stencil design considerations.
 - G. Side aperture dimensions over-print land for acceptable area ratio > 0.66. Customer may reduce side aperture dimensions if stencil manufacturing process allows for sufficient release at smaller opening.

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products

Amplifiers	amplifier.ti.com
Data Converters	dataconverter.ti.com
DSP	dsp.ti.com
Clocks and Timers	www.ti.com/clocks
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
RF/IF and ZigBee® Solutions	www.ti.com/lprf

Applications

Audio	www.ti.com/audio
Automotive	www.ti.com/automotive
Broadband	www.ti.com/broadband
Digital Control	www.ti.com/digitalcontrol
Medical	www.ti.com/medical
Military	www.ti.com/military
Optical Networking	www.ti.com/opticalnetwork
Security	www.ti.com/security
Telephony	www.ti.com/telephony
Video & Imaging	www.ti.com/video
Wireless	www.ti.com/wireless

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2008, Texas Instruments Incorporated