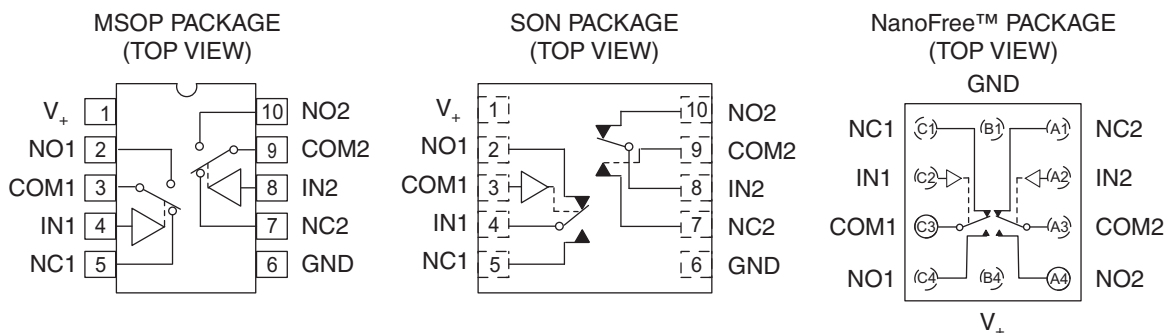


FEATURES

- Specified Break-Before-Make Switching
- Low ON-State Resistance (0.3 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
- Control Inputs Are 1.8-V Logic Compatible
- 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 TS3A24159 is a dual single-pole double-throw (SPDT) analog switch that is designed to operate from 1.65 V to 3.6 V. It offers low ON-state resistance and excellent ON-state resistance matching with the break-before-make feature, to prevent signal distortion during the transferring 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⁾		ORDERABLE PART NUMBER	TOP-SIDE MARKING
–40°C to 85°C	NanoFree™ (DSBGA) – YZP	Reel of 3000	TS3A24159YZPR	PREVIEW
	VSSOP – DGS (MSOP)	Reel of 2500	TS3A24159DGSR	L8R
	QFN – DRC (SON)	Reel of 3000	TS3A24159DRCR	ZWS

(1) 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.



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.

NanoFree is a trademark of Texas Instruments.

TS3A24159
0.3-Ω DUAL SPDT ANALOG SWITCH
DUAL-CHANNEL 2:1 MULTIPLEXER/DEMULTIPLEXER

SCDS238–MARCH 2007

SUMMARY OF CHARACTERISTICS⁽¹⁾

Configuration	Dual 2:1 Multiplexer/Demultiplexer (2 × SPDT)
Number of channels	2
ON-state resistance (r_{on})	0.3 Ω Max
ON-state resistance match (Δr_{on})	0.05 Ω Max
ON-state resistance flatness ($r_{on(flat)}$)	0.04 Ω Max
Turn-on/turn-off time (t_{ON}/t_{OFF})	20 ns/12 ns
Break-before-make time (t_{BBM})	10 ns
Charge injection (Q_C)	9 pC
Bandwidth (BW)	23 MHz
OFF isolation (O_{ISO})	–72 dB
Crosstalk (X_{TALK})	–96 dB
Total harmonic distortion (THD)	0.003%
Power-supply current (I_+)	15 nA
Package options	10-pin MSOP, SON, WCSP

(1) $V_+ = 2.7$ V, $T_A = 25^\circ\text{C}$

FUNCTION TABLE

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

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/OK}	Analog port diode current	V _{NC} , V _{NO} , V _{COM} < 0	−50	50	mA
I _{NC} I _{NO} I _{COM}	ON-state switch current	V _{NC} , V _{NO} , V _{COM} = 0 to V ₊	−300	300	mA
	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		mA
I ₊	Continuous current through V+			100	mA
I _{GND}	Continuous current through GND		−100		mA
θ _{JA}	Package thermal impedance ⁽⁷⁾	DGS package		165	°C/W
		DRC package		56.5	
		YZP package		TBD	
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.
- (7) The package thermal impedance is calculated in accordance with JESD 51-7.

TS3A24159
0.3-Ω DUAL SPDT ANALOG SWITCH
DUAL-CHANNEL 2:1 MULTIPLEXER/DEMULPLEXER

SCDS238–MARCH 2007

Electrical Characteristics for 3-V Supply⁽¹⁾

$V_+ = 2.7$ to 3.6 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}	$0 \leq (V_{\text{NO}} \text{ or } V_{\text{NC}}) \leq V_+$, $I_{\text{COM}} = -100$ mA,	Switch ON, See Figure 10	25°C Full	2.7 V	0.2	0.3 0.35	Ω
ON-state resistance	r_{on}	$V_{\text{NO}} \text{ or } V_{\text{NC}} = 2$ V, $I_{\text{COM}} = -100$ mA,	Switch ON, See Figure 10	25°C Full	2.7 V	0.26	0.3 0.34	Ω
ON-state resistance match between channels	Δr_{on}	$V_{\text{NO}} \text{ or } V_{\text{NC}} = 2$ V, 0.8 V, $I_{\text{COM}} = -100$ mA,	Switch ON, See Figure 10	25°C Full	2.7 V	0.01	0.05 0.05	Ω
ON-state resistance flatness	$r_{\text{on(flat)}}$	$0 \leq (V_{\text{NO}} \text{ or } V_{\text{NC}}) \leq V_+$, $I_{\text{COM}} = -100$ mA,	Switch ON, See Figure 10	25°C	2.7 V	0.13		Ω
		$V_{\text{NO}} \text{ or } V_{\text{NC}} = 2$ V, 0.8 V, $I_{\text{COM}} = -100$ mA,	Switch ON, See Figure 10	25°C Full		0.01	0.04 0.05	Ω
NC, NO OFF leakage current	$I_{\text{NC(OFF)}}, I_{\text{NO(OFF)}}$	$V_{\text{NC}} \text{ or } V_{\text{NO}} = 1$ V, $V_{\text{COM}} = 3$ V, or $V_{\text{NC}} \text{ or } V_{\text{NO}} = 3$ V, $V_{\text{COM}} = 1$ V,	Switch OFF, See Figure 11	25°C Full	3.6 V	-10	10 -50 50	nA
NC, NO ON leakage current	$I_{\text{NC(ON)}}, I_{\text{NO(ON)}}$	$V_{\text{NC}} \text{ or } V_{\text{NO}} = 1$ V, $V_{\text{COM}} = \text{Open}$, or $V_{\text{NC}} \text{ or } V_{\text{NO}} = 3$ V, $V_{\text{COM}} = \text{Open}$,	Switch ON, See Figure 12	25°C Full	3.6 V	-10	10 -100 100	nA
COM ON leakage current	$I_{\text{COM(ON)}}$	$V_{\text{NC}} \text{ or } V_{\text{NO}} = \text{Open}$, $V_{\text{COM}} = 1$ V, or $V_{\text{NC}} \text{ or } V_{\text{NO}} = \text{Open}$, $V_{\text{COM}} = 3$ V,	Switch ON, See Figure 12	25°C Full	3.6 V	-10	10 -100 100	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	$I_{\text{IH}}, I_{\text{IL}}$	$V_I = 3.6$ V or 0	25°C	3.6 V	-40	5	40	nA
			Full		-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.

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

$V_+ = 2.7$ to 3.6 V, $T_A = -40^\circ\text{C}$ to 85°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		9		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		90		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		224		pF
COM ON capacitance	$C_{COM(ON)}$	$V_{COM} = V_+$ or GND, Switch ON, See Figure 13	25°C	3 V		250		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		23		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		–96		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		0.003		%
Supply								
Positive supply current	I_+	$V_I = V_+$ or GND	25°C	3.6 V		15	100	nA
			Full				1	μA

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

TS3A24159
0.3-Ω DUAL SPDT ANALOG SWITCH
DUAL-CHANNEL 2:1 MULTIPLEXER/DEMULPLEXER

SCDS238–MARCH 2007

Electrical Characteristics for 2.5-V Supply⁽¹⁾

$V_+ = 2.3$ to 2.7 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}	$0 \leq (V_{\text{NO}} \text{ or } V_{\text{NC}}) \leq V_+$, $I_{\text{COM}} = -8$ mA,	Switch ON, See Figure 10	25°C Full	2.3 V	0.35 0.45		Ω
ON-state resistance	r_{on}	$V_{\text{NO}} \text{ or } V_{\text{NC}} = 1.8$ V, $I_{\text{COM}} = -8$ mA,	Switch ON, See Figure 10	25°C Full	2.3 V		0.4	Ω
ON-state resistance match between channels	Δr_{on}	$V_{\text{NO}} \text{ or } V_{\text{NC}} = 1.8$ V, 0.8 V, $I_{\text{COM}} = -8$ mA,	Switch ON, See Figure 10	25°C Full	2.3 V	0.01 0.05	0.05 0.05	Ω
ON-state resistance flatness	$r_{\text{on(flat)}}$	$0 \leq (V_{\text{NO}} \text{ or } V_{\text{NC}}) \leq V_+$, $I_{\text{COM}} = -8$ mA,	Switch ON, See Figure 10	25°C	2.3 V	0.05		Ω
		$V_{\text{NO}} \text{ or } V_{\text{NC}} = 0.8$ V, 1.8 V, $I_{\text{COM}} = -8$ mA,	Switch ON, See Figure 10	25°C		0.03	0.08	
				Full		0.1		
NC, NO OFF leakage current	$I_{\text{NC(OFF)}}, I_{\text{NO(OFF)}}$	$V_{\text{NC}} \text{ or } V_{\text{NO}} = 0.5$ V, $V_{\text{COM}} = 2.2$ V, or $V_{\text{NC}} \text{ or } V_{\text{NO}} = 2.2$ V, $V_{\text{COM}} = 0.5$ V,	Switch OFF, See Figure 11	25°C Full	2.7 V	-10 -50	10 50	nA
NC, NO ON leakage current	$I_{\text{NC(ON)}}, I_{\text{NO(ON)}}$	$V_{\text{NC}} \text{ or } V_{\text{NO}} = 0.5$ V, $V_{\text{COM}} = \text{Open}$, or $V_{\text{NC}} \text{ or } V_{\text{NO}} = 2.2$ V, $V_{\text{COM}} = \text{Open}$,	Switch ON, See Figure 12	25°C Full	2.7 V	-10 -100	10 100	nA
COM ON leakage current	$I_{\text{COM(ON)}}$	$V_{\text{NC}} \text{ or } V_{\text{NO}} = \text{Open}$, $V_{\text{COM}} = 0.5$ V, or $V_{\text{NC}} \text{ or } V_{\text{NO}} = \text{Open}$, $V_{\text{COM}} = 2.2$ V,	Switch ON, See Figure 12	25°C Full	2.7 V	-10 -100	10 100	nA
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	$I_{\text{IH}}, I_{\text{IL}}$	$V_{\text{I}} = 2.7$ V or 0	25°C Full	2.7 V	-40 -50	5	40 50	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.

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

$V_+ = 2.3$ to 2.7 V, $T_A = -40^\circ\text{C}$ to 85°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 Ω,	C _L = 35 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 Ω,	C _L = 35 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 Ω,	C _L = 35 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 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	90			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	250			pF
COM ON capacitance	C _{COM(ON)}	V _{COM} = V ₊ or GND, Switch ON,	See Figure 13	25°C	2.5 V	250			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 Ω, Switch ON,	See Figure 16	25°C	2.5 V	23			MHz
OFF isolation	O _{ISO}	R _L = 50 Ω, f = 1 MHz,	See Figure 17	25°C	2.5 V	−72			dB
Crosstalk	X _{TALK}	R _L = 50 Ω, f = 1 MHz,	See Figure 18	25°C	2.5 V	−96			dB
Total harmonic distortion	THD	R _L = 600 Ω, C _L = 50 pF,	f = 20 Hz to 20 kHz, See Figure 20	25°C	2.5 V	0.003			%
Supply									
Positive supply current	I ₊	V _I = V ₊ or GND	25°C	2.7 V	10		100	nA	
			Full		700				

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

TS3A24159
0.3-Ω DUAL SPDT ANALOG SWITCH
DUAL-CHANNEL 2:1 MULTIPLEXER/DEMULPLEXER

SCDS238–MARCH 2007

Electrical Characteristics for 1.8-V Supply⁽¹⁾

$V_+ = 1.65$ 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}	$0 \leq (V_{\text{NO}} \text{ or } V_{\text{NC}}) \leq V_+$, $I_{\text{COM}} = -2$ mA, Switch ON, See Figure 10	25°C Full	1.65 V		0.4 0.8	0.9	Ω
ON-state resistance	r_{on}	$V_{\text{NO}} \text{ or } V_{\text{NC}} = 1.5$ V, $I_{\text{COM}} = -2$ mA, Switch ON, See Figure 10	25°C Full	1.65 V		0.3 0.5	0.45	Ω
ON-state resistance match between channels	Δr_{on}	$V_{\text{NO}} \text{ or } V_{\text{NC}} = 0.6$ V, 1.5 V, $I_{\text{COM}} = -2$ mA, Switch ON, See Figure 10	25°C Full	1.65 V		0.02 0.05	0.04	Ω
ON-state resistance flatness	$r_{\text{on(flat)}}$	$0 \leq (V_{\text{NO}} \text{ or } V_{\text{NC}}) \leq V_+$, $I_{\text{COM}} = -2$ mA, Switch ON, See Figure 10	25°C Full	1.65 V		0.13 0.08 0.2	0.15	Ω
NC, NO OFF leakage current	$I_{\text{NC(OFF)}}, I_{\text{NO(OFF)}}$	$V_{\text{NC}} \text{ or } V_{\text{NO}} = 0.3$ V, $V_{\text{COM}} = 1.65$ V, or $V_{\text{NC}} \text{ or } V_{\text{NO}} = 1.65$ V, $V_{\text{COM}} = 0.3$ V, Switch OFF, See Figure 11	25°C Full	1.95 V	-10 -50		10 50	nA
NC, NO ON leakage current	$I_{\text{NC(ON)}}, I_{\text{NO(ON)}}$	$V_{\text{NC}} \text{ or } V_{\text{NO}} = 0.3$ V, $V_{\text{COM}} = \text{Open}$, or $V_{\text{NC}} \text{ or } V_{\text{NO}} = 1.65$ V, $V_{\text{COM}} = \text{Open}$, Switch ON, See Figure 12	25°C Full	1.95 V	-10 -100		10 100	nA
COM ON leakage current	$I_{\text{COM(ON)}}$	$V_{\text{NC}} \text{ or } V_{\text{NO}} = \text{Open}$, $V_{\text{COM}} = 0.3$ V, or $V_{\text{NC}} \text{ or } V_{\text{NO}} = \text{Open}$, $V_{\text{COM}} = 1.65$ V, Switch ON, See Figure 12	25°C Full	1.95 V	-10 -100		10 100	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	$I_{\text{IH}}, I_{\text{IL}}$	$V_{\text{I}} = 1.95$ V or 0	25°C Full	1.95 V	-40 -50	5	40 50	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.

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

$V_+ = 1.65$ 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
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	53	75		ns
			Full	1.65 V to 1.95 V		30		
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	30	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		5		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		90		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		250		pF
COM ON capacitance	$C_{COM(ON)}$	$V_{COM} = V_+$ or GND, Switch ON, See Figure 13	25°C	1.8 V		250		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		23		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		–97		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		0.005		%
Supply								
Positive supply current	I_+	$V_I = V_+$ or GND	25°C	1.95 V	100	50		nA
			Full			700		

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

TYPICAL PERFORMANCE

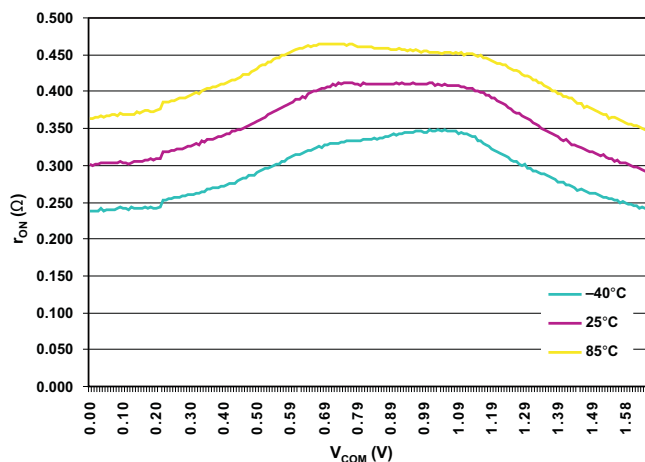


Figure 1. r_{ON} vs V_{COM}
($V_+ = 1.65$ V)

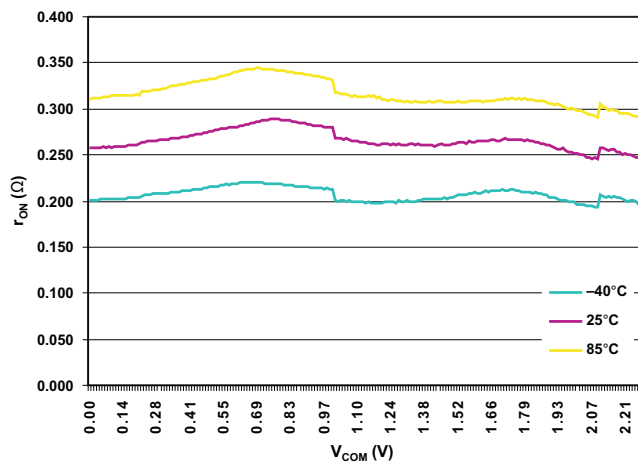


Figure 2. r_{ON} vs V_{COM}
($V_+ = 2.3$ V)

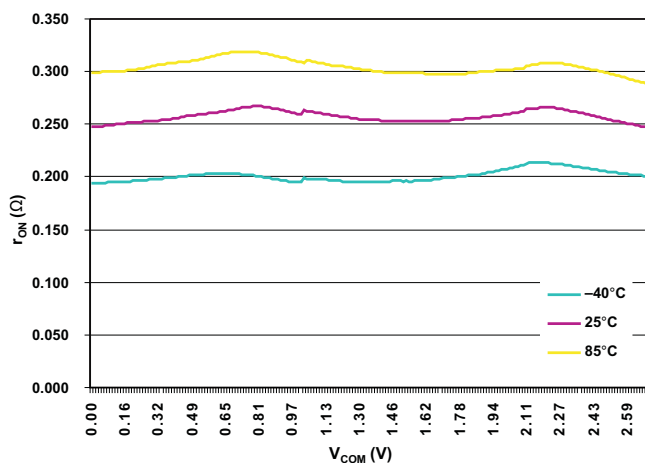


Figure 3. r_{ON} vs V_{COM}
($V_+ = 2.7$ V)

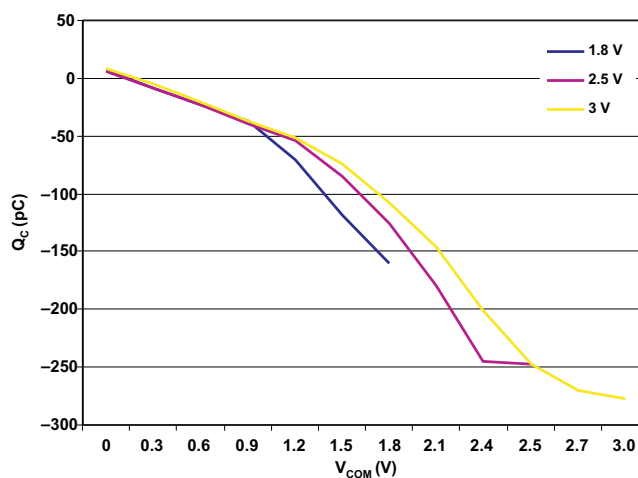


Figure 4. Charge Injection (Q_C) vs V_{COM}
($T_A = 25^\circ\text{C}$)

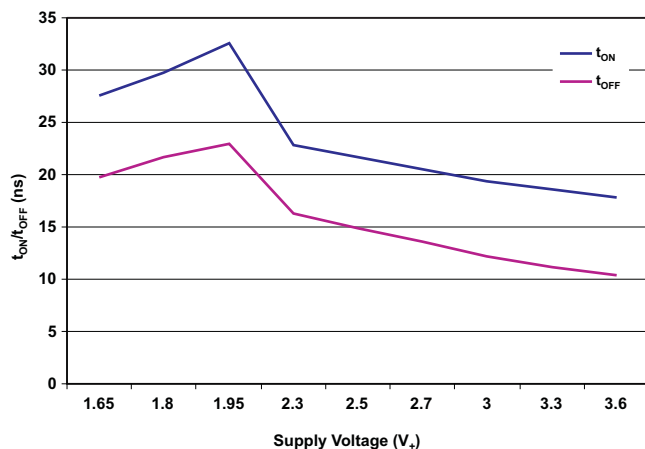


Figure 5. t_{ON} and t_{OFF} vs Supply Voltage
($T_A = 25^\circ\text{C}$)

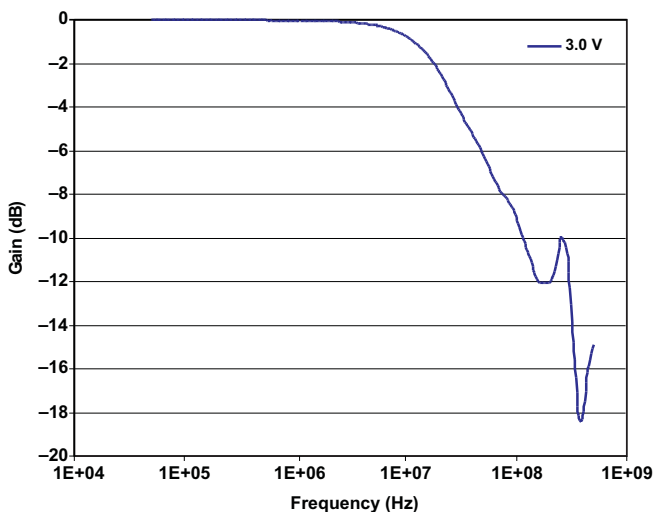


Figure 6. Bandwidth

TYPICAL PERFORMANCE (continued)

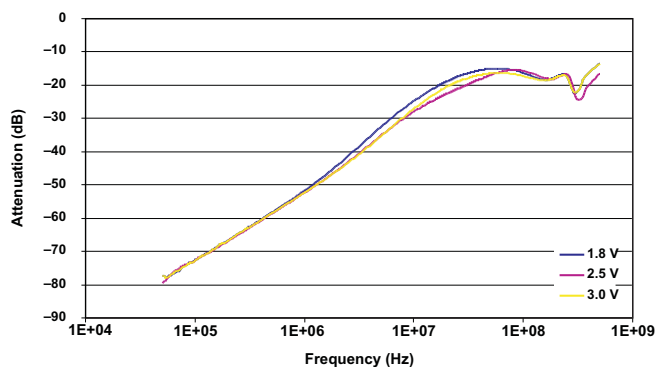


Figure 7. OFF Isolation

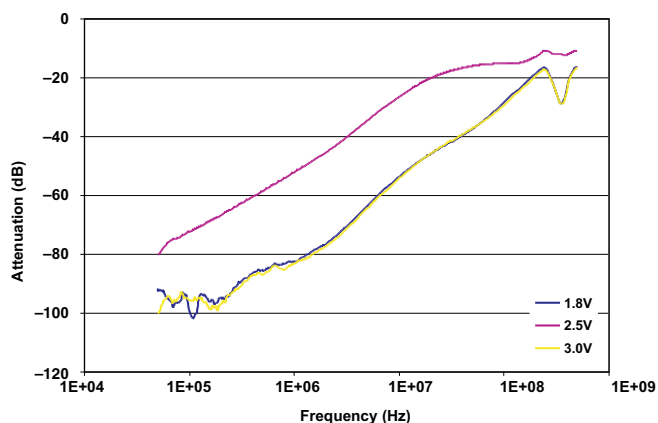


Figure 8. Crosstalk

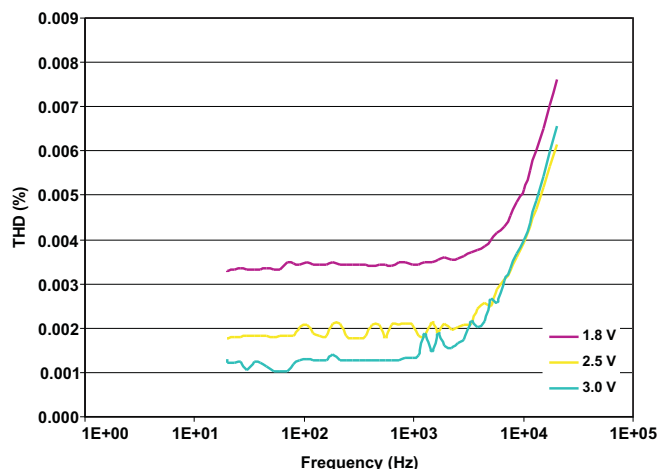


Figure 9. Total Harmonic Distortion vs Frequency

PARAMETER MEASUREMENT INFORMATION

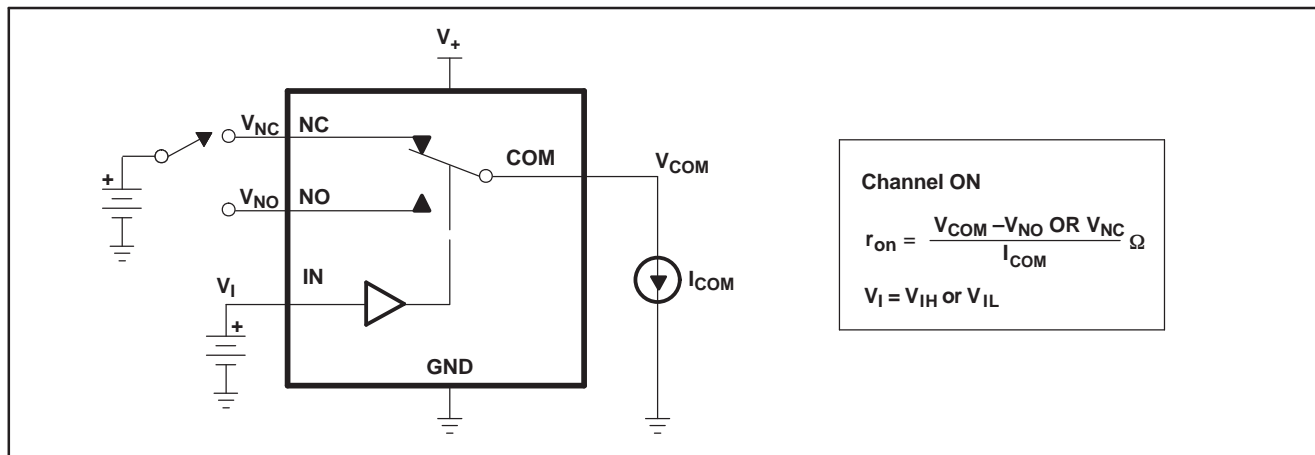


Figure 10. ON-State Resistance

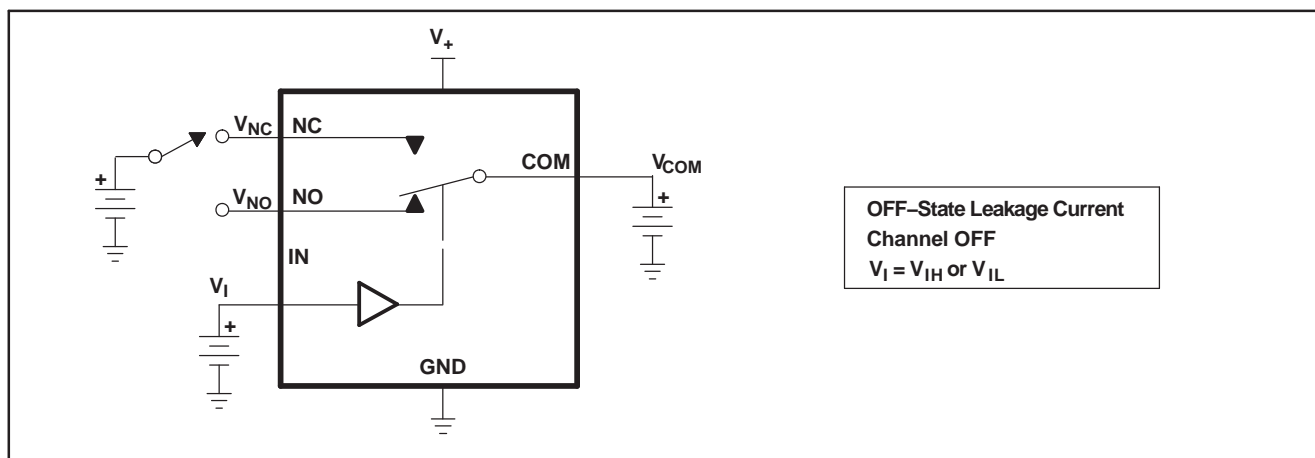


Figure 11. OFF-State Leakage Current
($I_{NC(OFF)}$, $I_{NC(PWROFF)}$, $I_{NO(OFF)}$, $I_{NO(PWROFF)}$, $I_{COM(OFF)}$, $I_{COM(PWROFF)}$)

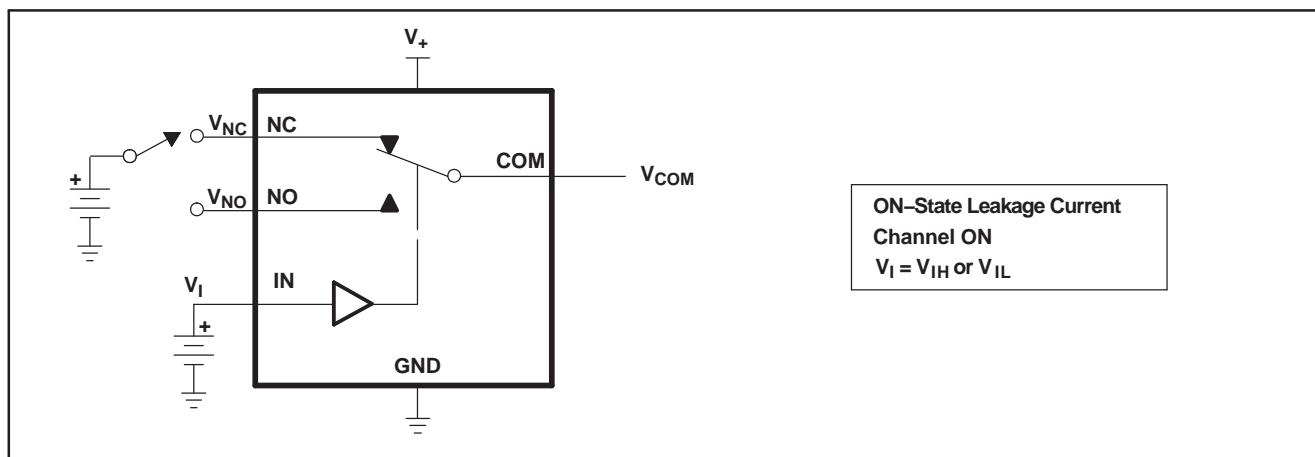


Figure 12. ON-State Leakage Current
($I_{COM(ON)}$, $I_{NC(ON)}$, $I_{NO(ON)}$)

PARAMETER MEASUREMENT INFORMATION (continued)

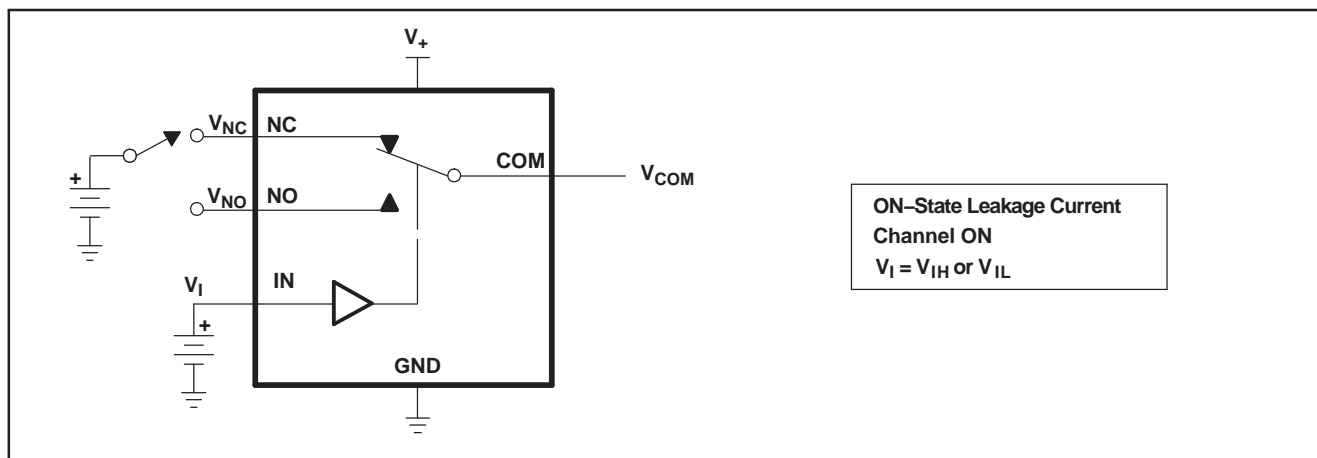
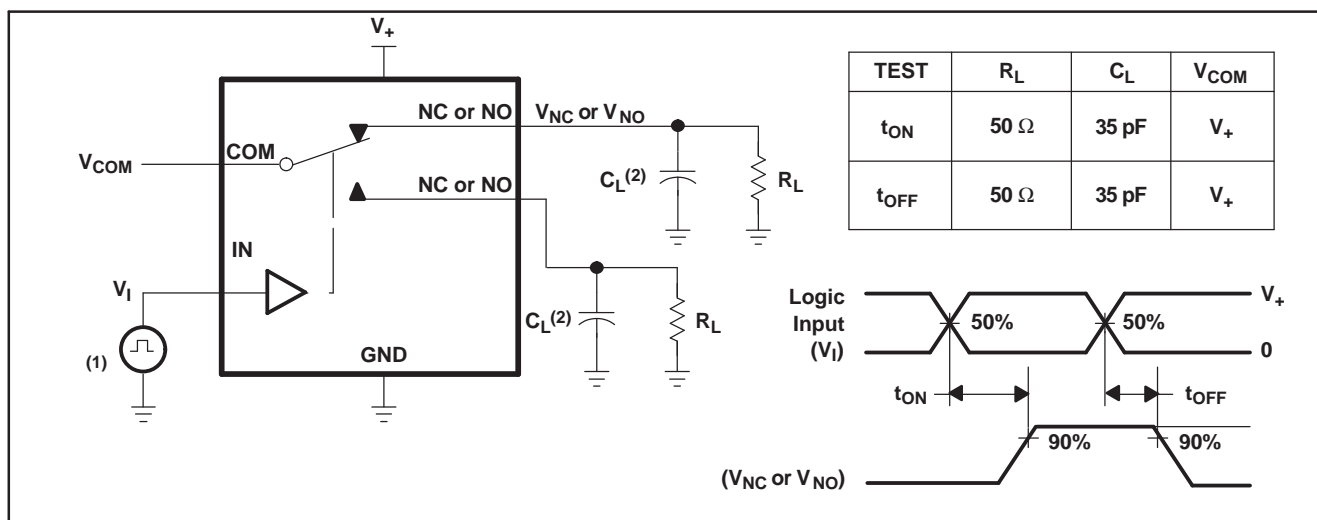


Figure 13. Capacitance
(C_I , $C_{NC(OFF)}$, $C_{NO(OFF)}$, $C_{NC(ON)}$, $C_{NO(ON)}$)

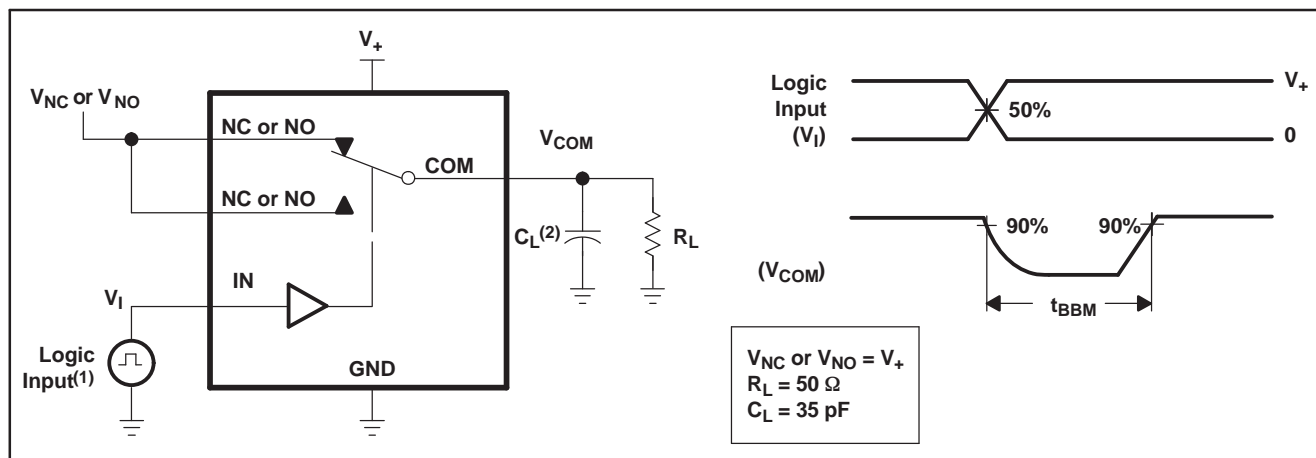


(1) All input pulses are supplied by generators having the following characteristics: $PRR \leq 10$ MHz, $Z_O = 50 \Omega$, $t_r < 5$ ns, $t_f < 5$ ns.

(2) C_L includes probe and jig capacitance.

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

PARAMETER MEASUREMENT INFORMATION (continued)



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

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

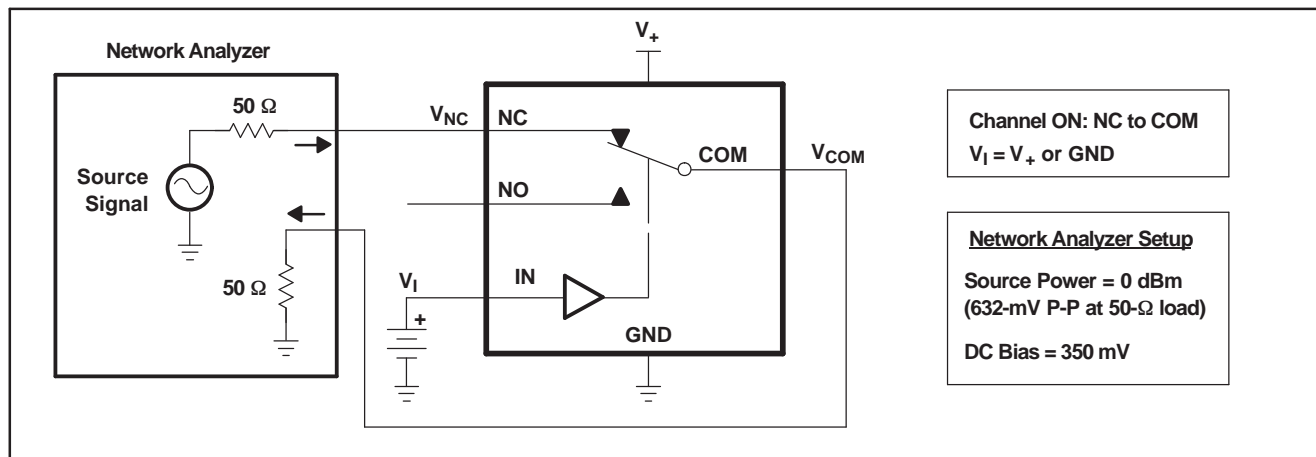


Figure 16. Bandwidth (BW)

PARAMETER MEASUREMENT INFORMATION (continued)

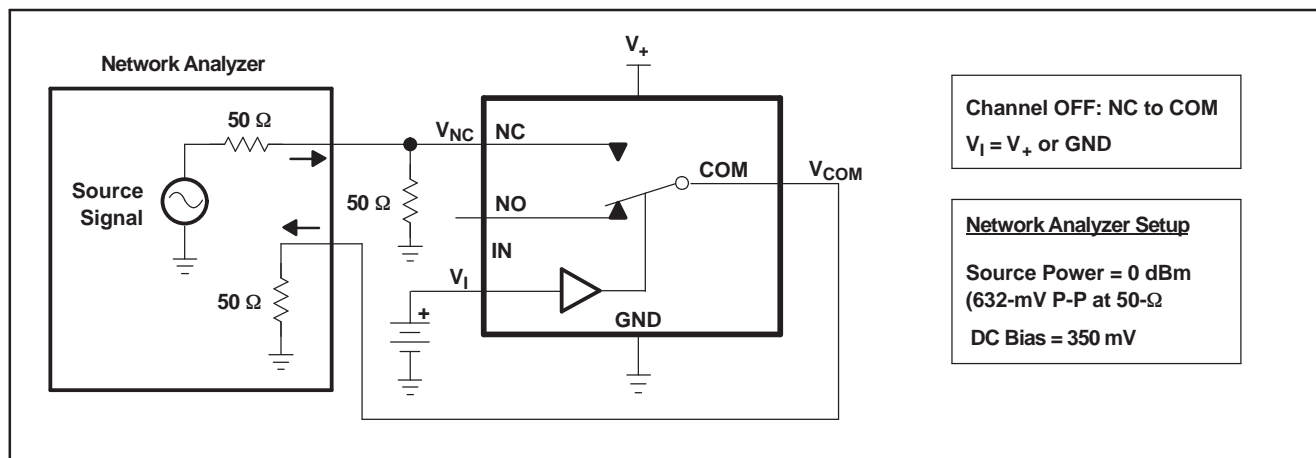


Figure 17. OFF Isolation (O_{Iso})

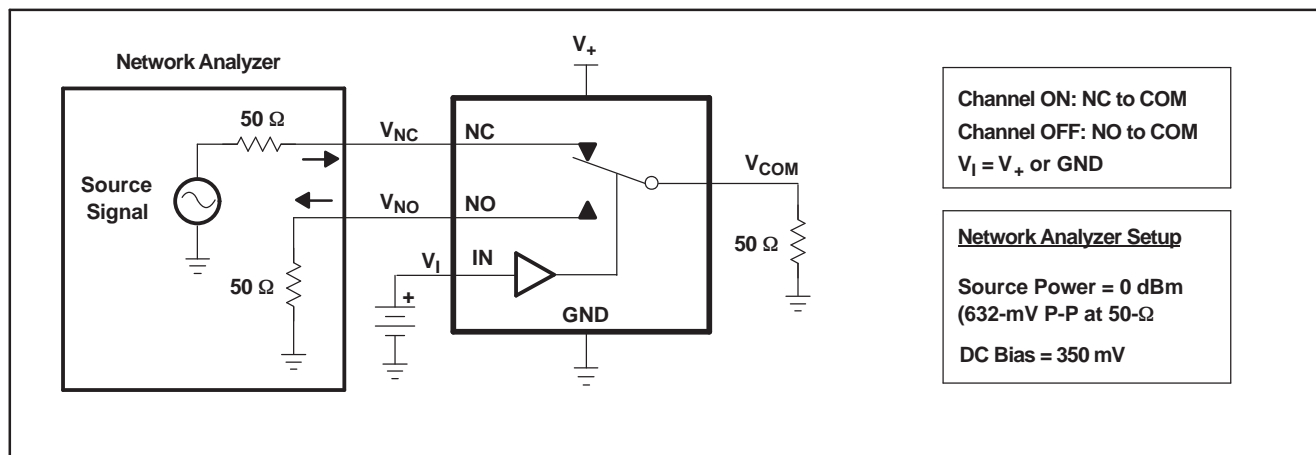
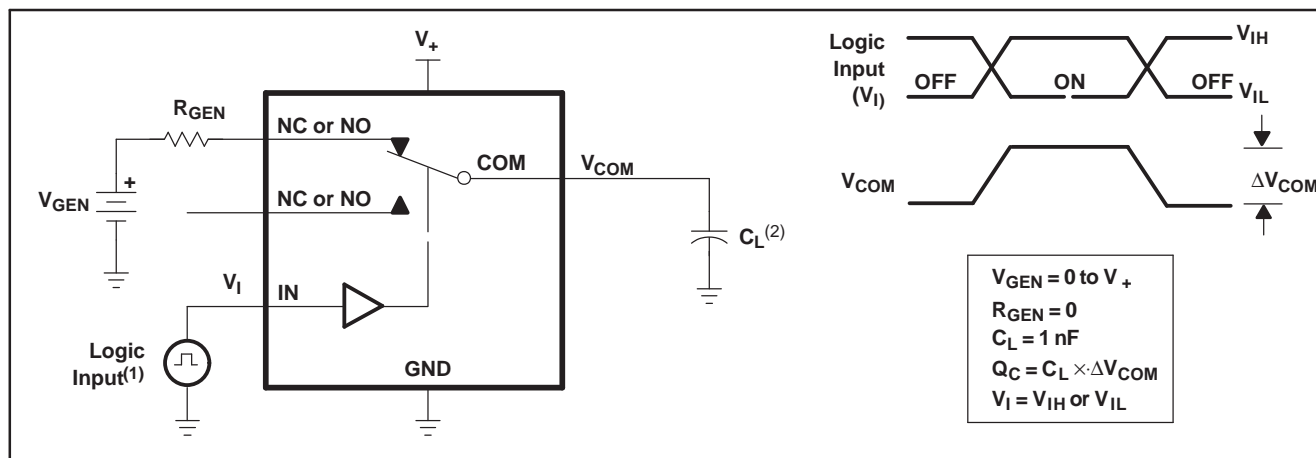


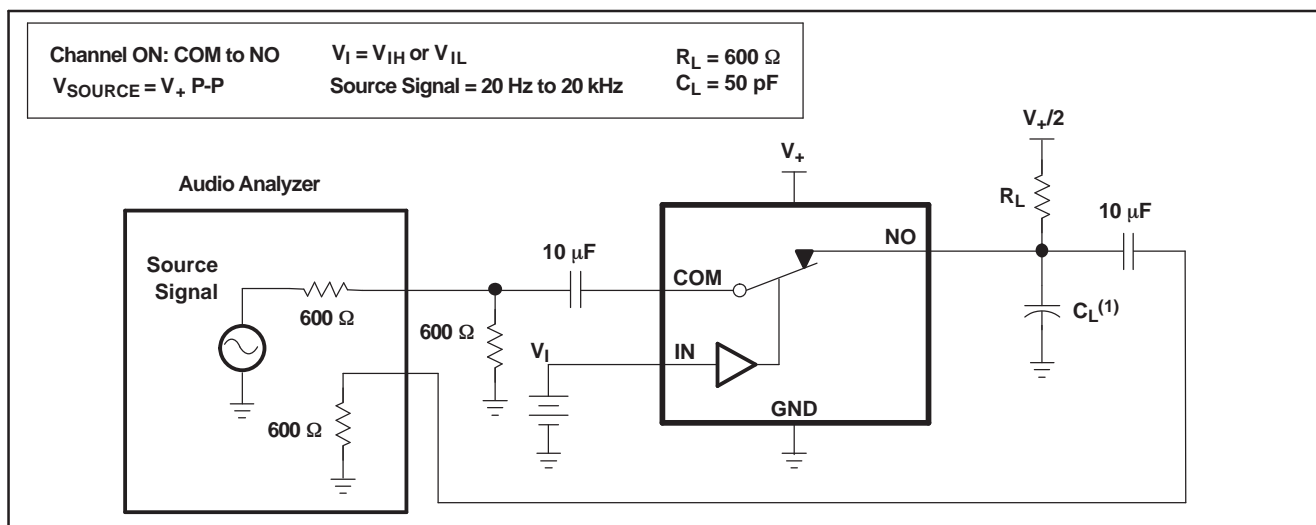
Figure 18. Crosstalk (X_{TALK})

PARAMETER MEASUREMENT INFORMATION (continued)



- (1) 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.
- (2) C_L includes probe and jig capacitance.

Figure 19. Charge Injection (Q_C)



- (1) 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⁾
TS3A24159DGSR	ACTIVE	MSOP	DGS	10	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TS3A24159DGSRG4	ACTIVE	MSOP	DGS	10	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TS3A24159DRCR	ACTIVE	SON	DRC	10	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR
TS3A24159DRCRG4	ACTIVE	SON	DRC	10	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR

⁽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.

DGS (S-PDSO-G10)

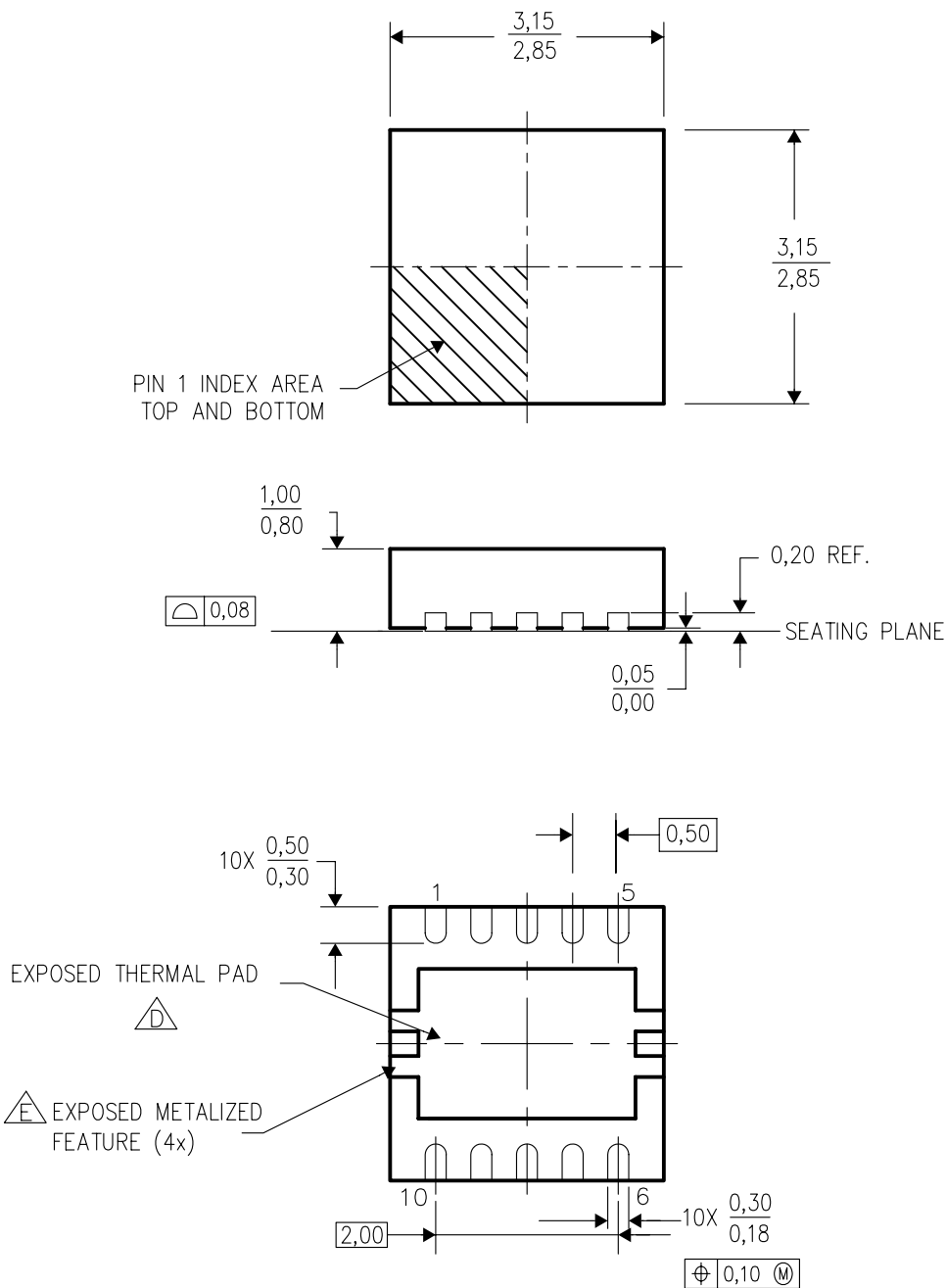
PLASTIC SMALL-OUTLINE PACKAGE



4073272/C 02/04

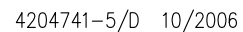
DRC (S-PDSO-N10)

PLASTIC SMALL OUTLINE



4204102/F 06/06

- 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. Small Outline No-Lead (SON) package configuration.
 D. The package thermal pad must be soldered to the board for thermal and mechanical performance. See the Product Data Sheet for details regarding the exposed thermal pad dimensions.
 E. Metalized features are supplier options and may not be on the package.



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. NanoFree™ package configuration.
D. This package is a lead-free solder ball design.

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 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.

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
Interface	interface.ti.com
Logic	logic.ti.com
Power Mgmt	power.ti.com
Microcontrollers	microcontroller.ti.com
RFID	www.ti-rfid.com
Low Power Wireless	www.ti.com/lpw

Applications

Audio	www.ti.com/audio
Automotive	www.ti.com/automotive
Broadband	www.ti.com/broadband
Digital Control	www.ti.com/digitalcontrol
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 © 2007, Texas Instruments Incorporated