TS5A3159
1-Ω SPDT ANALOG SWITCH

SCDS174B – AUGUST 2004 – REVISED MAY 2005

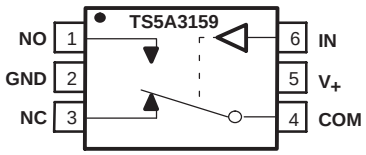
Description

The TS5A3159 is a single-pole double-throw (SPDT) analog switch that is designed to operate from 1.65 V to 5.5 V. The device offers a low ON-state resistance and an excellent ON-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 an excellent total harmonic distortion (THD) performance and consumes very low power. These features make this device suitable for portable audio applications.

Applications

- **Cell Phones**
- **PDAs**
- **Portable Instrumentation**

SOT-23 OR SC-70 PACKAGE
(TOP VIEW)



FUNCTION TABLE

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

Features

- **Specified Break-Before-Make Switching**
- **Low ON-State Resistance (1 Ω)**
- **Control Inputs Are 5-V Tolerant**
- **Low Charge Injection**
- **Excellent ON-Resistance Matching**
- **Low Total Harmonic Distortion**
- **1.65-V to 5.5-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)**

Summary of Characteristics

V_+ = 5 V and T_A = 25 °C

Configuration	2:1 Multiplexer/ Demultiplexer (1 × SPDT)
Number of channels	1
ON-state resistance (r_{on})	1.1 Ω
ON-state resistance match (Δr_{on})	0.1 Ω
ON-state resistance flatness ($r_{on(flat)}$)	0.15 Ω
Turn on/turn off time (t_{ON}/t_{OFF})	20 ns/15 ns
Break-before-make time (t_{BBM})	12 ns
Charge injection (Q_C)	36 pC
Bandwidth (BW)	100 MHz
OFF isolation (O_{ISO})	−65 dB at 1 MHz
Crosstalk (X_{TALK})	−65 dB at 1 MHz
Total harmonic distortion (THD)	0.01%
Leakage current ($I_{NO(OFF)}$/$I_{NC(OFF)}$)	±20 nA
Package option	6-pin DBV or DCK

ORDERING INFORMATION

T_A	PACKAGE(1)		ORDERABLE PART NUMBER	TOP-SIDE MARKING(2)
−40°C to 85°C	SOT (SOT-23) − DBV	Tape and reel	TS5A3159DBVR	JA8_
	SOT (SC-70) − DCK(2)	Tape and reel	TS5A3159DCKR	JA_

(1) Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.
(2) DBV/DCK: The actual top-side marking has one additional character that designates the assembly/test site.

Absolute Maximum Ratings(1)

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

			MIN	MAX	UNIT
V_+	Supply voltage range(2)		−0.5	6.5	V
V_{NO}, V_{COM}	Analog voltage range(2)(3)(4)		−0.5	V_+ + 0.5	V
$I_{I/OK}$	Analog port diode current	V_{NO}, V_{COM} < 0 or V_{NO}, V_{COM} > V_+		±50	mA
I_{NO}, I_{COM}	ON−state switch current	V_{NO}, V_{COM} = 0 to V_+		±200	mA
	ON−state peak switch current(5)			±400	mA
V_{IN}	Digital input voltage range(2)(3)		−0.5	6.5	V
I_{IK}	Digital input clamp current	V_{IN} < 0		−50	mA
	Continuous current through V_+ or GND			±100	mA
θ_{JA}	Package thermal impedance(6)			165	°C
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) 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) Pulse at 1 ms duration < 10% duty cycle.
(6) The package thermal impedance is calculated in accordance with JESD 51-7.

Electrical Characteristics for 5-V Supply

V_+ = 4.5 V to 5.5 V and T_A = −40°C to 85°C (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A	V_+	MIN	TYP(1)	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} = −30 mA,	Switch ON, See Figure 11	25°C	4.5 V		1	1.5	Ω
				Full				1.5	
ON-state resistance	r_{on}	V_{NO} or V_{NC} = 2.5 V, I_{COM} = −30 mA,	Switch ON, See Figure 11	25°C	4.5 V		0.75	1.1	Ω
				Full				1.1	
ON-state resistance match between channels	Δr_{on}	V_{NO} or V_{NC} = 2.5 V, I_{COM} = −30 mA,	Switch ON, See Figure 11	25°C	4.5 V		0.1		Ω
ON-state resistance flatness	$r_{on(flat)}$	0 ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = −30 mA,	Switch ON, See Figure 11	25°C	4.5 V		0.233		Ω
		V_{NO} or V_{NC} = 1 V, 1.5 V, 2.5 V, I_{COM} = −30 mA,		25°C			0.15		
NC, NO OFF leakage current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	V_{NC} or V_{NO} = 4.5 V, V_{COM} = 0,	Switch OFF, See Figure 12	25°C	5.5 V	−2	0.2	2	nA
				Full		−20		20	
NC, NO ON leakage current	$I_{NC(ON)}$, $I_{NO(ON)}$	V_{NC} or V_{NO} = 4.5 V, V_{COM} = Open,	Switch ON, See Figure 13	25°C	5.5 V	−4	2.8	4	nA
				Full		−40		40	
COM ON leakage current	$I_{COM(ON)}$	V_{NC} or V_{NO} = 4.5 V or Open, V_{COM} = 4.5 V,	Switch ON, See Figure 13	25°C	5.5 V	−4	0.47	4	nA
				Full		−40		40	
Digital Inputs (IN)									
Input logic high	V_{IH}			Full		2.4		5.5	V
Input logic low	V_{IL}			Full		0		0.8	V
Input leakage current	I_{IH}, I_{IL}	V_{IN} = 5.5 V or 0		Full	5.5 V	−1		1	µA

(1) T_A = 25°C

Electrical Characteristics for 5-V Supply (continued)

V_+ = 4.5 V to 5.5 V and T_A = −40°C to 85°C (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A	V_+	MIN	TYP(1)	MAX	UNIT
Dynamic									
Turn-on time	t_{ON}	V_{COM} = V_+, R_L = 50 Ω,	C_L = 35 pF, See Figure 15	25°C	4.5 V to 5.5 V		20	35	ns
				Full				40	
Turn-off time	t_{OFF}	V_{COM} = V_+, R_L = 50 Ω,	C_L = 35 pF, See Figure 15	25°C	4.5 V to 5.5 V		15	20	ns
				Full				35	
Break-before-make time	t_{BBM}	V_{NC} = V_{NO} = V_+/2, R_L = 50 Ω,	C_L = 35 pF, See Figure 16	25°C	4.5 V to 5.5 V	1	12	14.5	ns
				Full		1			
Charge injection	Q_C	C_L = 1 nF, V_{GEN} = 0 V,	See Figure 20	25°C	5 V		36		pC
NC, NO OFF capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$	V_{NC} or V_{NO} = V_+ or GND, Switch OFF,	See Figure 14	25°C	5 V		23		pF
NC, NO ON capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$	V_{NC} or V_{NO} = V_+ or GND, Switch ON,	See Figure 14	25°C	5 V		84		pF
COM ON capacitance	$C_{COM(ON)}$	V_{COM} = V_+ or GND, Switch ON,	See Figure 14	25°C	5 V		84		pF
Digital input capacitance	C_{IN}	V_{IN} = V_+ or GND,	See Figure 14	25°C	5 V		2.1		pF
Bandwidth	BW	R_L = 50 Ω, Switch ON,	See Figure 17	25°C	5 V		100		MHz
OFF isolation	O_{ISO}	R_L = 50 Ω, f = 1 MHz,	Switch OFF, See Figure 18	25°C	5 V		−65		dB
Crosstalk	X_{TALK}	R_L = 50 Ω, f = 1 MHz,	Switch ON, See Figure 19	25°C	5 V		−65		dB
Total harmonic distortion	THD	R_L = 600 Ω, C_L = 50 pF,	f = 600 Hz to 20 kHz, See Figure 21	25°C	5 V		0.01		%
Supply									
Positive supply current	I_+	V_{IN} = V_+ or GND,	Switch ON or OFF	Full	5.5 V			0.1	µA

(1) T_A = 25°C

Electrical Characteristics for 3.3-V Supply

V_+ = 3 V to 3.6 V and T_A = −40°C to 85°C (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A	V_+	MIN	TYP(1)	MAX	UNIT
Analog Switch									
Analog signal range	V_{COM}, V_{NO}, V_{NC}					0		V_+	V
Peak ON-state resistance	r_{peak}	0 ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = −24 mA,	Switch ON, See Figure 11	25°C	3 V		1.35	2.1	Ω
				Full				2.1	
ON-state resistance	r_{on}	V_{NO} or V_{NC} = 2 V, I_{COM} = −24 mA,	Switch ON, See Figure 11	25°C	3 V		1.15	1.5	Ω
				Full				1.5	
ON-state resistance match between channels	Δr_{on}	V_{NO} or V_{NC} = 2 V, 0.8 V, I_{COM} = −24 mA,	Switch ON, See Figure 11	25°C	3 V		0.11		Ω
ON-state resistance flatness	$r_{on(flat)}$	0 ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = −24 mA,	Switch ON, See Figure 11	25°C	3 V		0.225		Ω
		V_{NO} or V_{NC} = 2 V, 0.8 V, I_{COM} = −24 mA,		25°C			0.25		
NC, NO OFF leakage current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	V_{NC} or V_{NO} = 3 V, V_{COM} = 0,	Switch OFF, See Figure 12	25°C	3.6 V		0.2		nA
NC, NO ON leakage current	$I_{NC(ON)}$, $I_{NO(ON)}$	V_{NC} or V_{NO} = 3 V, V_{COM} = Open,	Switch ON, See Figure 13	25°C	3.6 V		2.8		nA
COM ON leakage current	$I_{COM(ON)}$	V_{NC} or V_{NO} = 3 V or Open, V_{COM} = 3 V,	Switch ON, See Figure 13	25°C	3.6 V		0.47		nA
Digital Inputs (IN)									
Input logic high	V_{IH}			Full		2		5.5	V
Input logic low	V_{IL}			Full		0	0.6		V
Input leakage current	I_{IH}, I_{IL}	V_{IN} = 5.5 V or 0		Full	3.6 V	−1		1	µA

(1) T_A = 25°C

Electrical Characteristics for 3.3-V Supply (continued)

(V_+ = 3 V to 3.6 V and T_A = −40 °C to 85 °C) (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A	V_+	MIN	TYP(1)	MAX	UNIT
Dynamic									
Turn-on time	t_{ON}	V_{COM} = V_+, R_L = 50 Ω,	C_L = 35 pF, See Figure 15	25°C	3 V to 3.6 V		30	40	ns
				Full				55	
Turn-off time	t_{OFF}	V_{COM} = V_+, R_L = 50 Ω,	C_L = 35 pF, See Figure 15	25°C	3 V to 3.6 V		20	25	ns
				Full				40	
Break-before-make time	t_{BBM}	V_{NC} = V_{NO} = V_+/2, R_L = 50 Ω,	C_L = 35 pF, See Figure 16	25°C	3 V to 3.6 V	1	21	29	ns
				Full		1			
Charge injection	Q_C	C_L = 1 nF, V_{GEN} = 0 V,	See Figure 20	25°C	3.3 V		20		pC
NC, NO OFF capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$	V_{NC} or V_{NO} = V_+ or GND, Switch OFF,	See Figure 14	25°C	3.3 V		23		pF
NC, NO ON capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$	V_{NC} or V_{NO} = V_+ or GND, Switch ON,	See Figure 14	25°C	3.3V		84		pF
COM ON capacitance	$C_{COM(ON)}$	V_{COM} = V_+ or GND, Switch ON,	See Figure 14	25°C	3.3 V		84		pF
Digital input capacitance	C_{IN}	V_{IN} = V_+ or GND,	See Figure 14	25°C	3.3 V		2.1		pF
Bandwidth	BW	R_L = 50 Ω, Switch ON,	See Figure 17	25°C	3.3 V		100		MHz
OFF isolation	O_{ISO}	R_L = 50 Ω, f = 1 MHz,	Switch OFF, See Figure 18	25°C	3.3 V		−65		dB
Crosstalk	X_{TALK}	R_L = 50 Ω, f = 1 MHz,	Switch ON, See Figure 19	25°C	3.3 V		−65		dB
Total harmonic distortion	THD	R_L = 600 Ω, C_L = 50 pF,	f = 600 Hz to 20 kHz, See Figure 21	25°C	3.3 V		0.015		%
Supply									
Positive supply current	I_+	V_{IN} = V_+ or GND,	Switch ON or OFF	Full	3.6 V			0.1	µA

(1) T_A = 25°C

Electrical Characteristics for 2.5-V Supply

V_+ = 2.3 V to 2.7 V and T_A = −40°C to 85°C (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A	V_+	MIN	TYP(1)	MAX	UNIT
Analog Switch									
Analog signal range	V_{COM}, V_{NO}, V_{NC}					0		V_+	V
Peak ON-state resistance	r_{peak}	0 ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = −8 mA,	Switch ON, See Figure 11	25°C	2.5 V		1.7	2.7	Ω
				Full				2.7	
ON-state resistance	r_{on}	V_{NO} or V_{NC} = 1.8 V, I_{COM} = −8 mA,	Switch ON, See Figure 11	25°C	2.5 V		1.45	2	Ω
				Full				2	
ON-state resistance match between channels	Δr_{on}	V_{NO} or V_{NC} = 0.8 V, 1.8 V, I_{COM} = −8 mA,	Switch ON, See Figure 11	25°C	2.5 V		0.7		Ω
ON-state resistance flatness	$r_{on(flat)}$	0 ≤ V_{NO} or V_{NC} ≤ V_+, I_{COM} = −8 mA,	Switch ON, See Figure 11	25°C	2.5 V		0.5		Ω
		V_{NO} or V_{NC} = 0.8 V, 1.8 V, I_{COM} = −8 mA,		25°C			0.45		
NC, NO Off leakage current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	V_{NC} or V_{NO} = 2.3 V, V_{COM} = 0,	Switch OFF, See Figure 12	25°C	2.7 V		0.2		nA
NC, NO On leakage current	$I_{NC(ON)}$, $I_{NO(ON)}$	V_{NC} or V_{NO} = 2.3 V, V_{COM} = Open,	Switch ON, See Figure 13	25°C	2.7 V		2.8		nA
COM On leakage current	$I_{COM(ON)}$	V_{NC} or V_{NO} = 2.3 V or Open, V_{COM} = 2.3 V,	Switch ON, See Figure 13	25°C	2.7 V		0.47		nA
Digital Inputs (IN)									
Input logic high	V_{IH}			Full		1.8		5.5	V
Input logic low	V_{IL}			Full		0		0.6	V
Input leakage current	I_{IH}, I_{IL}	V_{IN} = 5.5 V or 0		Full	2.7 V	−1		1	µA

(1) T_A = 25°C

Electrical Characteristics for 2.5-V Supply (continued)

V_+ = 2.3 V to 2.7 V and T_A = −40°C to 85°C (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A	V_+	MIN	TYP(1)	MAX	UNIT
Dynamic									
Turn-on time	t_{ON}	V_{COM} = V_+, R_L = 50 Ω,	C_L = 35 pF, See Figure 15	25°C	2.3 V to 2.7 V		40	55	ns
				Full				70	
Turn-off time	t_{OFF}	V_{COM} = V_+, R_L = 50 Ω,	C_L = 35 pF, See Figure 15	25°C	2.3 V to 2.7 V		30	40	ns
				Full				55	
Break-before-make time	t_{BBM}	V_{NC} = V_{NO} = V_+/2, R_L = 50 Ω,	C_L = 35 pF, See Figure 16	25°C	2.3 V to 2.7 V	1	33	39	ns
				Full		1			
Charge injection	Q_C	C_L = 1 nF, V_{GEN} = 0 V,	See Figure 20	25°C	2.5 V		13		pC
NC, NO OFF capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$	V_{NC} or V_{NO} = V_+ or GND, Switch OFF,	See Figure 14	25°C	2.5 V		23		pF
NC, NO ON capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$	V_{NC} or V_{NO} = V_+ or GND, Switch ON,	See Figure 14	25°C	2.5V		84		pF
COM ON capacitance	$C_{COM(ON)}$	V_{COM} = V_+ or GND, Switch ON,	See Figure 14	25°C	2.5 V		84		pF
Digital input capacitance	C_{IN}	V_{IN} = V_+ or GND,	See Figure 14	25°C	2.5 V		2.1		pF
Bandwidth	BW	R_L = 50 Ω, Switch ON,	See Figure 17	25°C	2.5 V		100		MHz
OFF isolation	O_{ISO}	R_L = 50 Ω, f = 1 MHz,	Switch OFF, See Figure 18	25°C	2.5 V		−64		dB
Crosstalk	X_{TALK}	R_L = 50 Ω, f = 1 MHz,	Switch ON, See Figure 19	25°C	2.5 V		−64		dB
Total harmonic distortion	THD	R_L = 600 Ω, C_L = 50 pF,	f = 600 Hz to 20 kHz, See Figure 21	25°C	2.5 V		0.025		%
Supply									
Positive supply current	I_+	V_{IN} = V_+ or GND,	Switch ON or OFF	Full	2.7 V			0.1	µA

(1) T_A = 25°C

Electrical Characteristics for 1.8-V Supply

V_+ = 1.65 V to 1.95 V and T_A = −40°C to 85°C (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A	V_+	MIN	TYP(1)	MAX	UNIT
Analog Switch									
Analog signal range	V_{COM}, V_{NO}, V_{NC}					0		V_+	V
Peak ON-state resistance	r_{peak}	$0 \le V_{NO}$ or $V_{NC} \le V_+$, I_{COM} = −2 mA,	Switch ON, See Figure 11	25°C	1.8 V		4	4.9	Ω
				Full				4.9	
ON-state resistance	r_{on}	V_{NO} or V_{NC} = 1.5 V, I_{COM} = −2 mA,	Switch ON, See Figure 11	25°C	1.8 V		1.7	3.2	Ω
				Full				3.2	
ON-state resistance match between channels	Δr_{on}	V_{NO} or V_{NC} = 0.6 V, 1.5 V, I_{COM} = −2 mA,	Switch ON, See Figure 11	25°C	1.8 V		0.7		Ω
				Full			0.7		
ON-state resistance flatness	$r_{on(flat)}$	$0 \le V_{NO}$ or $V_{NC} \le V_+$, I_{COM} = −2 mA,	Switch ON, See Figure 11	25°C	1.8 V		1.85		Ω
				Full			1.85		
		V_{NO} or V_{NC} = 0.6 V, 1.5 V, I_{COM} = −2 mA,		25°C			0.9		
				Full			0.9		
NC, NO Off leakage current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	V_{NC} or V_{NO} = 1.65 V, V_{COM} = 0,	Switch OFF, See Figure 12	25°C	1.95 V		0.2		nA
NC, NO On leakage current	$I_{NC(ON)}$, $I_{NO(ON)}$	V_{NC} or V_{NO} = 1.65 V, V_{COM} = Open,	Switch ON, See Figure 13	25°C	1.95 V		2.8		nA
COM On leakage current	$I_{COM(ON)}$	V_{NC} or V_{NO} = 1.65 V or Open, V_{COM} = 1.65 V,	Switch ON, See Figure 13	25°C	1.95 V		0.47		nA
Digital Inputs (IN)									
Input logic high	V_{IH}			Full		1.5		5.5	V
Input logic low	V_{IL}			Full		0		0.6	V
Input leakage current	I_{IH}, I_{IL}	V_{IN} = 5.5 V or 0		Full	1.95 V	−1		1	µA

(1) T_A = 25°C

Electrical Characteristics for 1.8-V Supply (continued)

V_+ = 1.65 V to 1.95 V and T_A = −40°C to 85°C (unless otherwise noted)

PARAMETER	SYMBOL	TEST CONDITIONS		T_A	V_+	MIN	TYP(1)	MAX	UNIT
Dynamic									
Turn-on time	t_{ON}	V_{COM} = V_+, R_L = 50 Ω,	C_L = 35 pF, See Figure 15	25°C	1.65 V to 1.95 V		65	70	ns
				Full				95	
Turn-off time	t_{OFF}	V_{COM} = V_+, R_L = 50 Ω,	C_L = 35 pF, See Figure 15	25°C	1.65 V to 1.95 V		40	55	ns
				Full				70	
Break-before-make time	t_{BBM}	V_{NC} = V_{NO} = V_+/2, R_L = 50 Ω,	C_L = 35 pF, See Figure 16	25°C	1.65 V to 1.95 V	1	60	72	ns
				Full		0.5			
Charge injection	Q_C	C_L = 1 nF, V_{GEN} = 0 V,	See Figure 20	25°C	1.8 V		13		pC
NC, NO OFF capacitance	$C_{NC(OFF)}$, $C_{NO(OFF)}$	V_{NC} or V_{NO} = V_+ or GND, Switch OFF,	See Figure 14	25°C	1.8 V		23		pF
NC, NO ON capacitance	$C_{NC(ON)}$, $C_{NO(ON)}$	V_{NC} or V_{NO} = V_+ or GND, Switch ON,	See Figure 14	25°C	1.8V		84		pF
COM ON capacitance	$C_{COM(ON)}$	V_{COM} = V_+ or GND, Switch ON,	See Figure 14	25°C	1.8 V		84		pF
Digital input capacitance	C_{IN}	V_{IN} = V_+ or GND,	See Figure 14	25°C	1.8 V		2.1		pF
Bandwidth	BW	R_L = 50 Ω, Switch ON,	See Figure 17	25°C	1.8 V		100		MHz
OFF isolation	O_{ISO}	R_L = 50 Ω, f = 1 MHz,	Switch OFF, See Figure 18	25°C	1.8 V		−63		dB
Crosstalk	X_{TALK}	R_L = 50 Ω, f = 1 MHz,	Switch ON, See Figure 19	25°C	1.8 V		−63		dB
Supply									
Positive supply current	I_+	V_{IN} = V_+ or GND,	Switch ON or OFF	Full	1.95 V			0.1	µA

(1) T_A = 25°C

TYPICAL PERFORMANCE

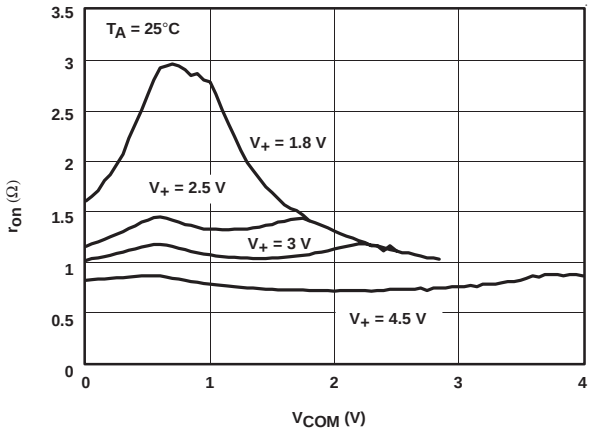


Figure 1. r_{on} vs V_{COM}

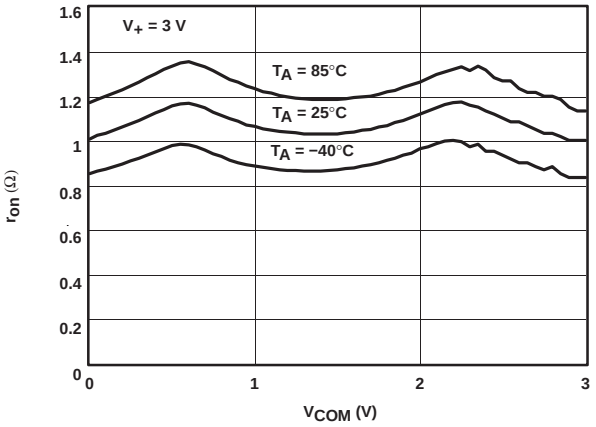


Figure 2. r_{on} vs V_{COM}

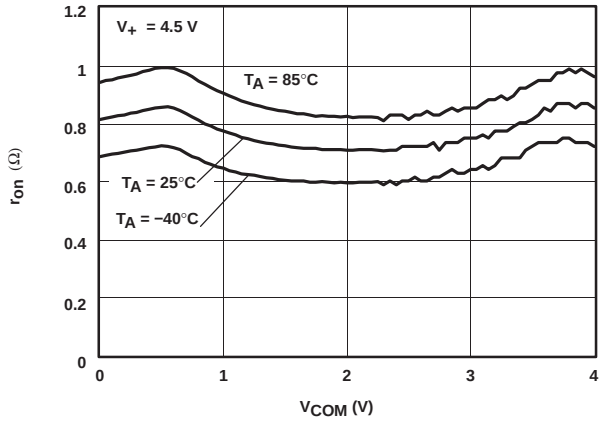


Figure 3. r_{on} vs V_{COM}

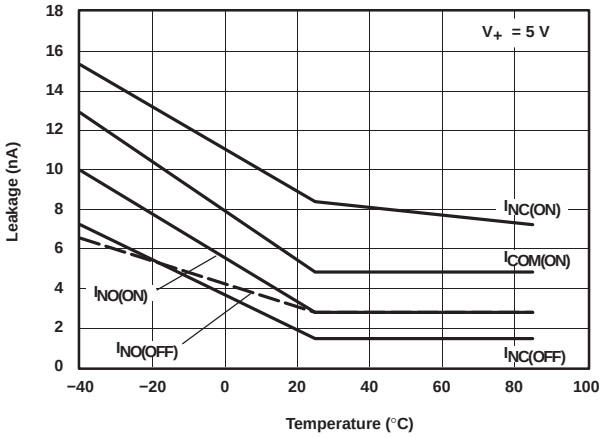


Figure 4. Leakage Current vs Temperature

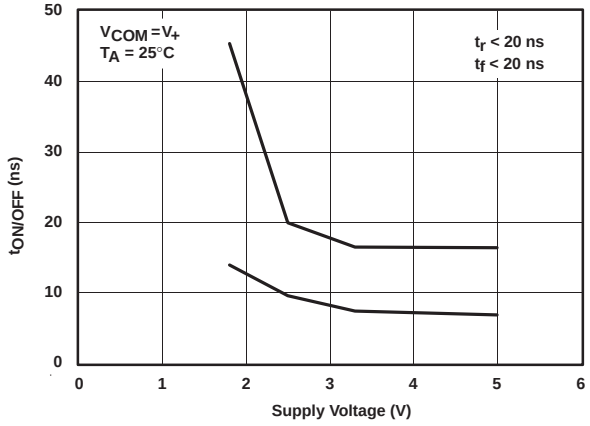


Figure 5. $t_{ON/OFF}$ vs V_+

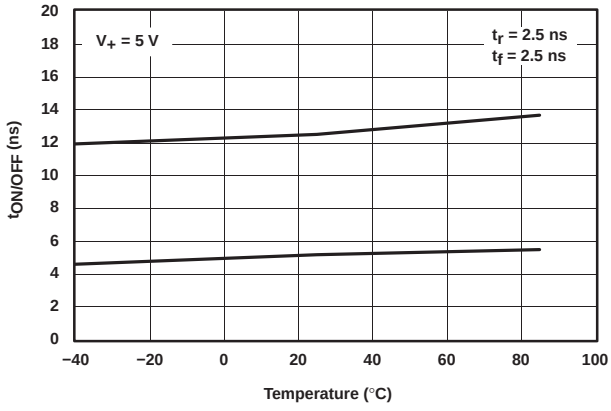


Figure 6. $t_{ON/OFF}$ vs Temperature

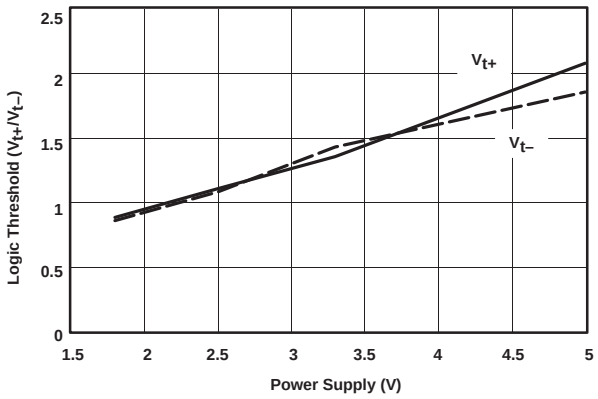


Figure 7. Logic Threshold vs Power Supply

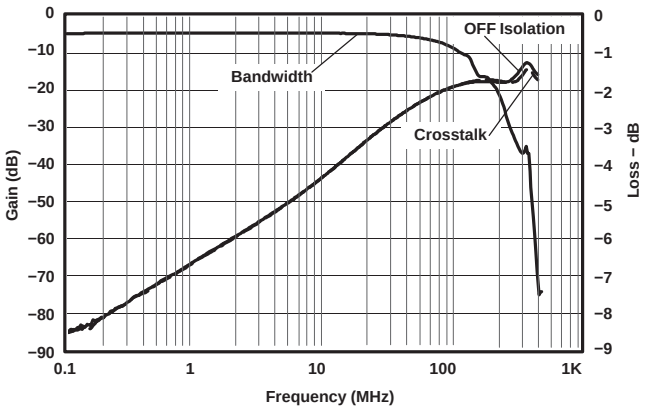


Figure 8. Frequency Response

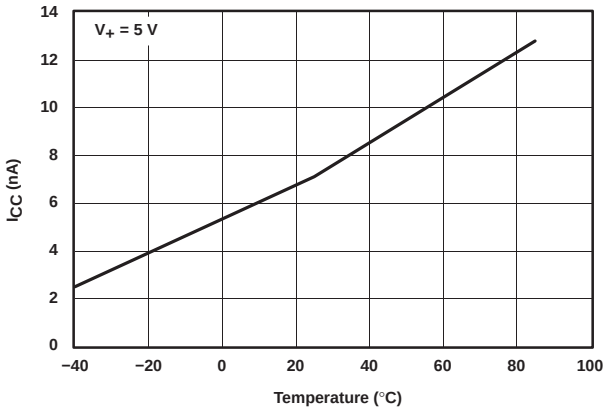


Figure 9. Power-Supply Current vs Temperature

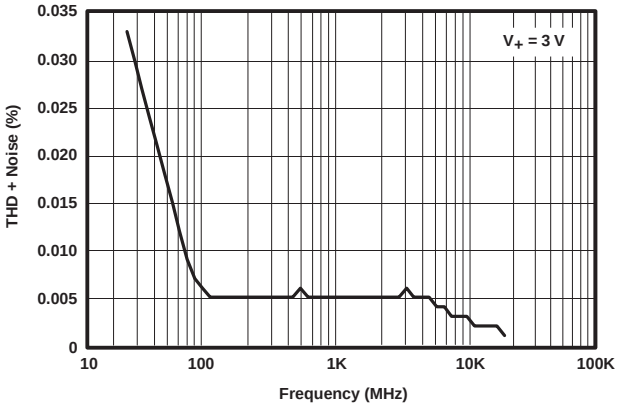


Figure 10. Total Harmonic Distortion (THD) vs Frequency

PIN DESCRIPTION

PIN NUMBER	NAME	DESCRIPTION
1	NO	Normally-open terminal
2	GND	Digital ground
3	NC	Normally-closed terminal
4	COM	Common terminal
5	V_+	Power supply
6	IN	Digital control pin to connect COM terminal to NO or NC terminals

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
$r_{on(flat)}$	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
$I_{NO(OFF)}$	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
$I_{NC(ON)}$	Leakage current measured at the NC port, with the corresponding channel (NC to COM) in the ON state and the output (COM) being 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) being 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) being open
V_{IH}	Minimum input voltage for logic high for the control input (IN)
V_{IL}	Minimum input voltage for logic low for the control input (IN)
V_{IN}	Voltage at IN
I_{IH}, I_{IL}	Leakage current measured at 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 outputs (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 outputs (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, $Q_C = C_L \times \Delta V_O$, C_L is the load capacitance, and ΔV_O is the change in analog output voltage.

PARAMETER DESCRIPTION (continued)

SYMBOL	DESCRIPTION
$C_{NC(OFF)}$	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_{IN}	Capacitance of IN
O_{ISO}	OFF isolation of the switch is a measurement 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.
I_+	Static power-supply current with the control (IN) pin at V_+ or GND
ΔI_+	This is the increase in I_+ for each control (IN) input that is at the specified voltage, rather than at V_+ or GND.

PARAMETER MEASUREMENT INFORMATION

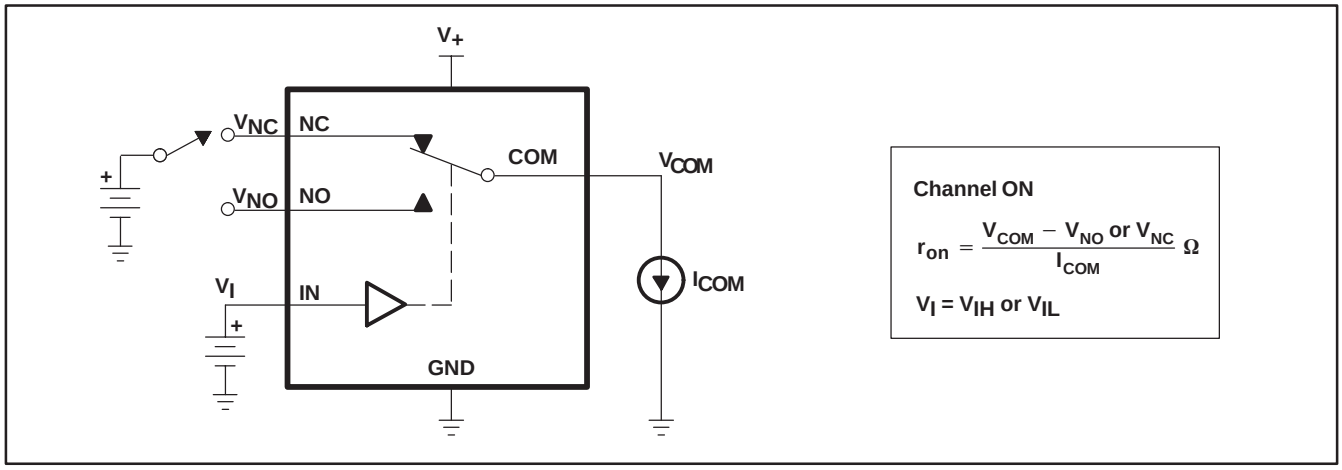


Figure 11. ON-State Resistance (r_{on})

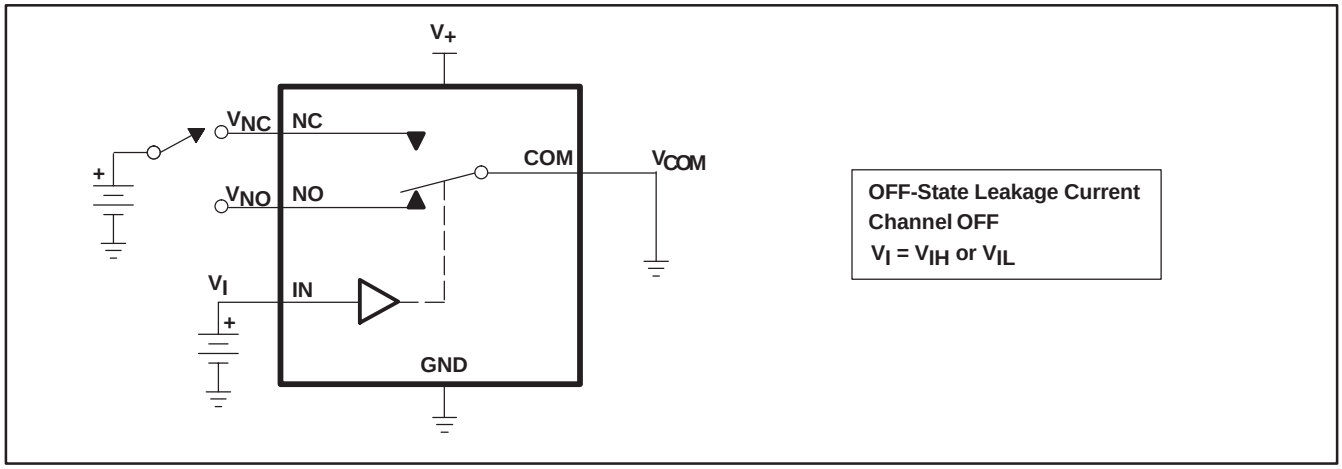


Figure 12. OFF-State Leakage Current ($I_{NC(OFF)}$, $I_{NO(OFF)}$)

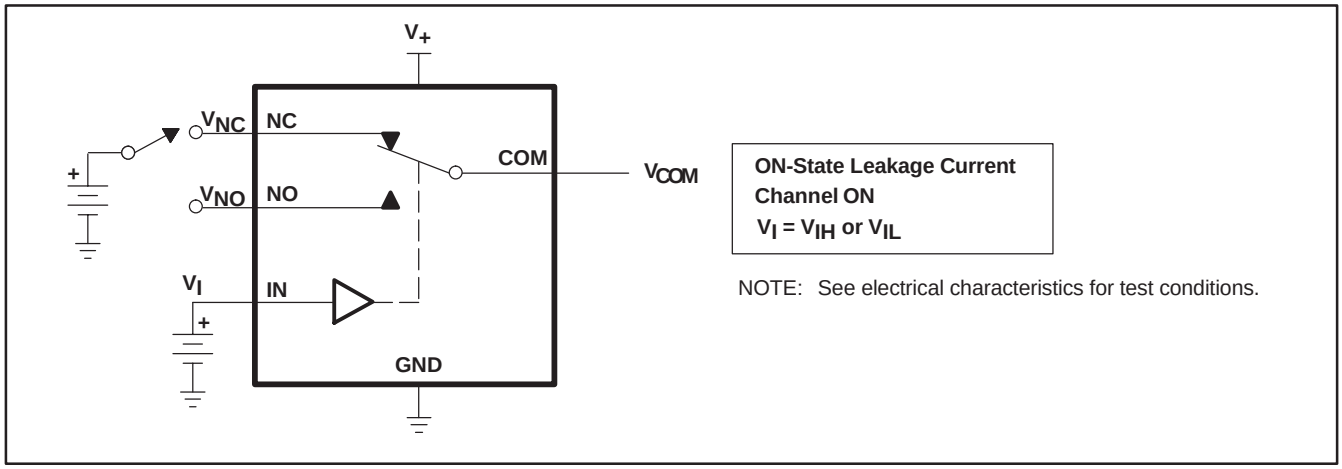


Figure 13. ON-State Leakage Current ($I_{COM(ON)}$, $I_{NC(ON)}$, $I_{NO(ON)}$)

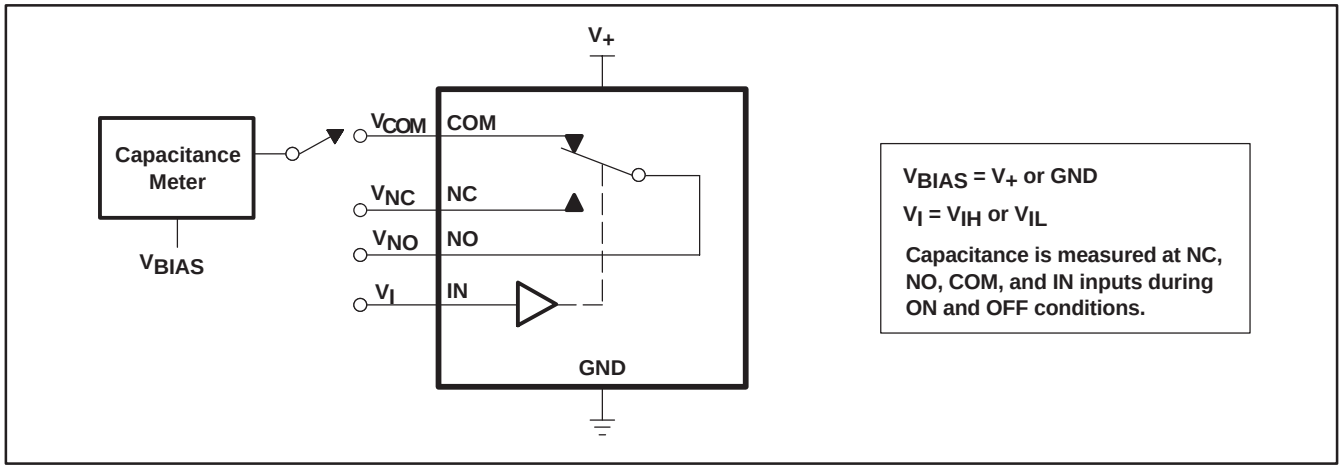
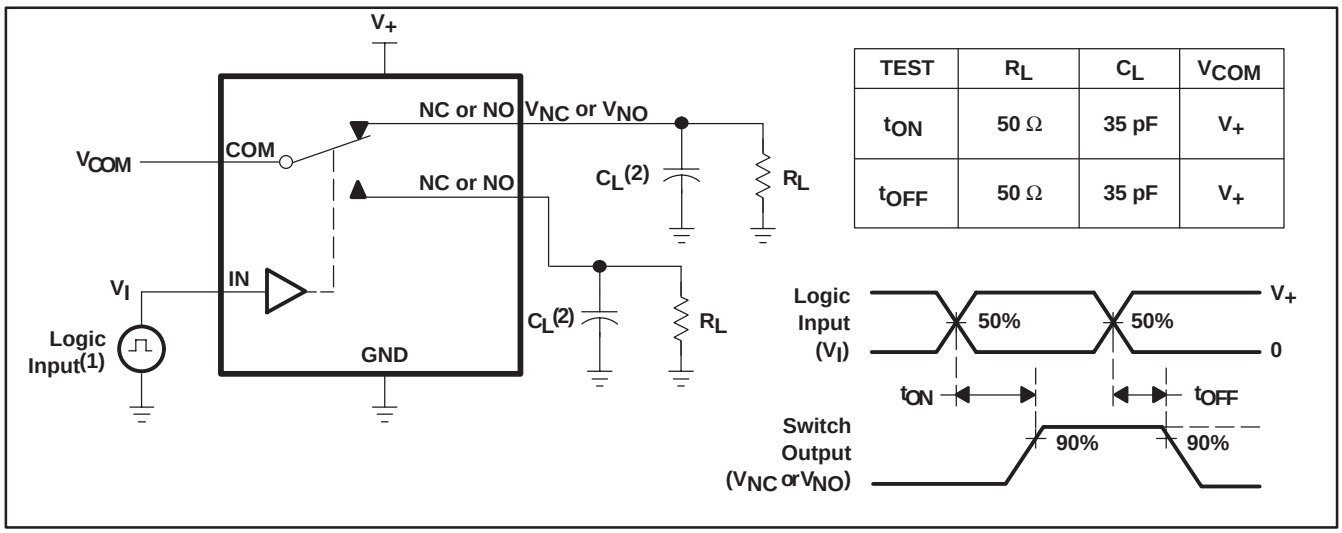


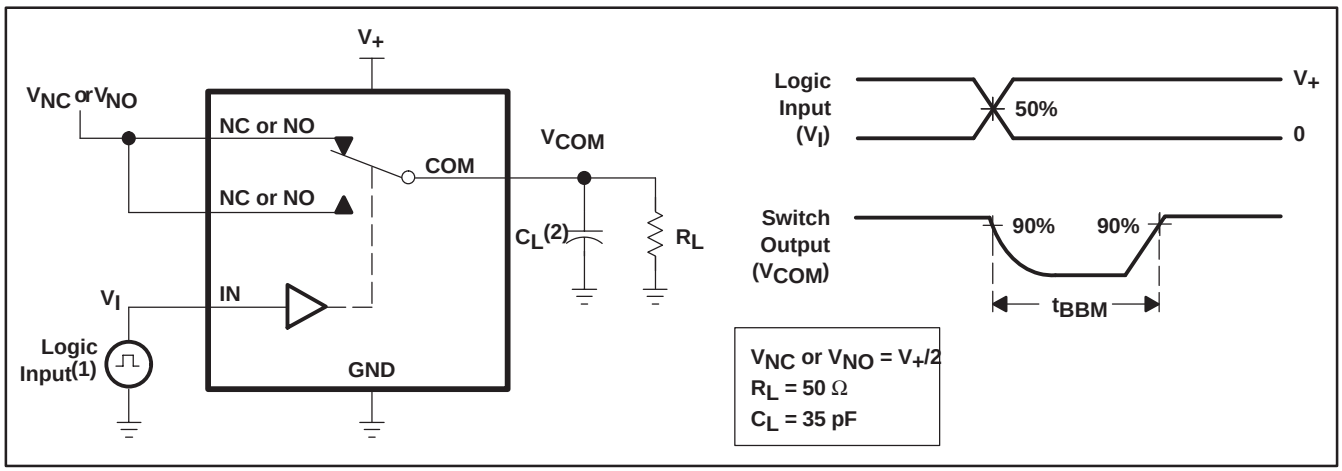
Figure 14. Capacitance (C_I, $C_{COM(ON)}$, $C_{NC(OFF)}$, $C_{NO(OFF)}$, $C_{NC(ON)}$, $C_{NO(ON)}$)



TEST	R_L	C_L	V_{COM}
t_{ON}	50 Ω	35 pF	V_+
t_{OFF}	50 Ω	35 pF	V_+

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



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

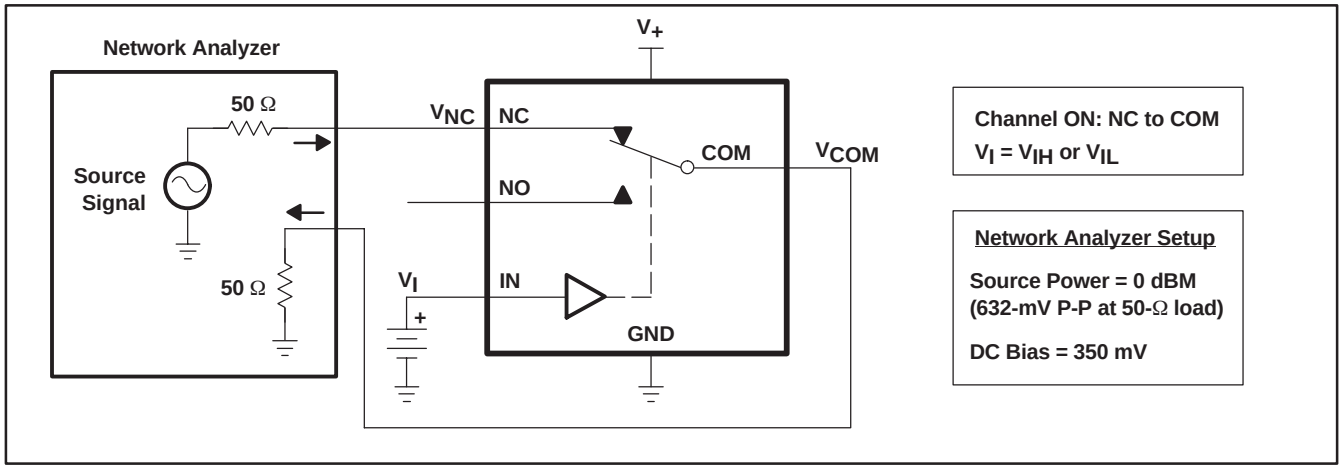


Figure 17. Bandwidth (BW)

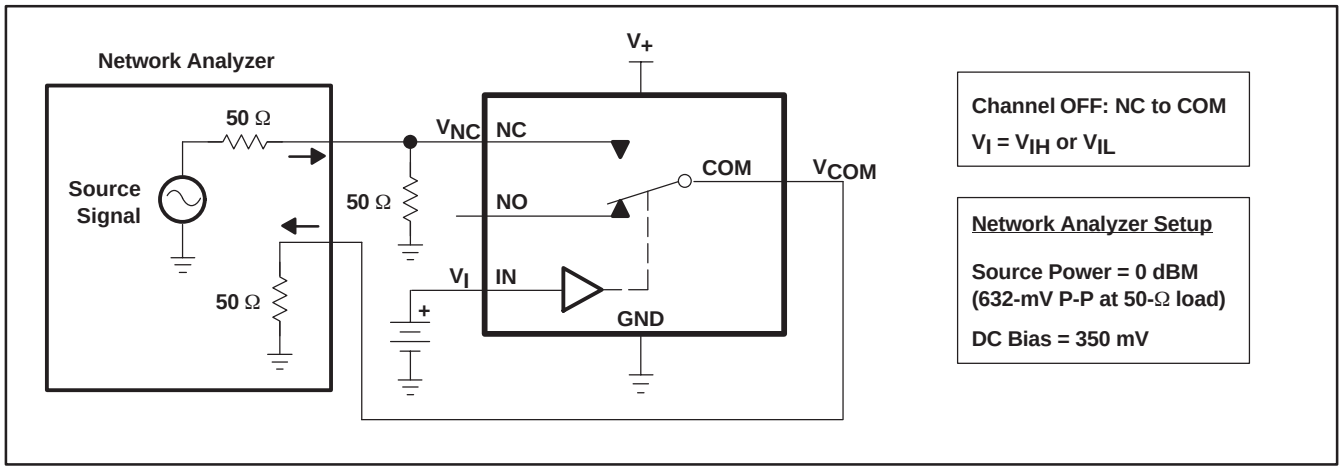


Figure 18. OFF Isolation (O_{ISO})

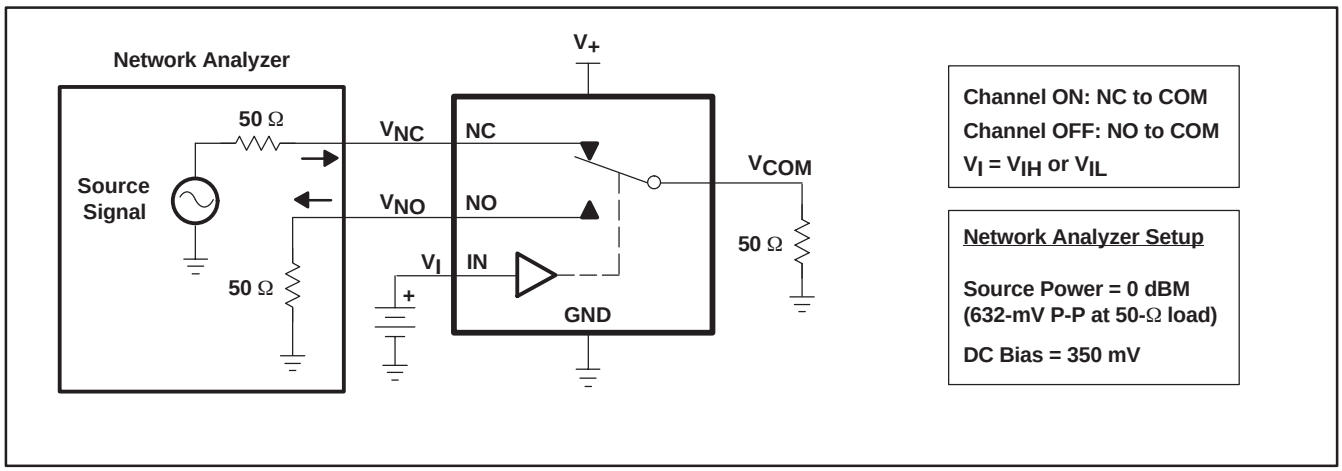
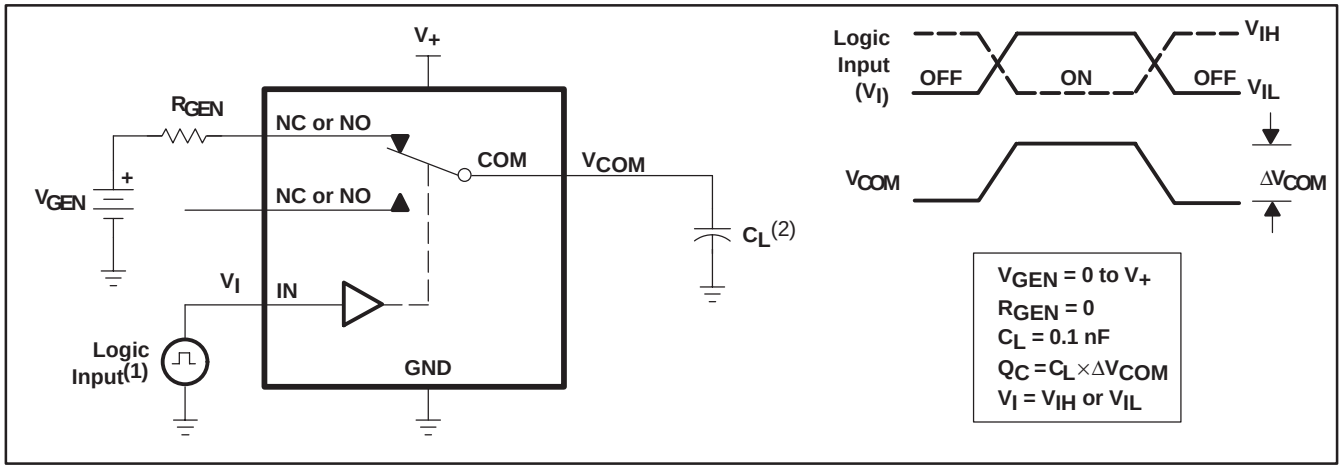
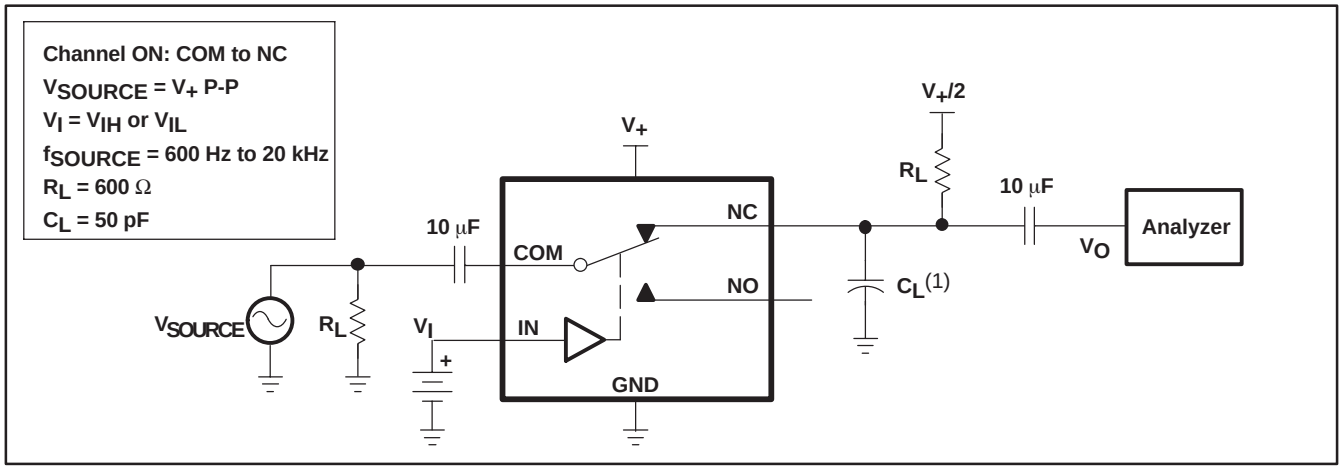


Figure 19. Crosstalk (X_{TALK})



(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 20. Charge Injection (Q_C)



(1) C_L includes probe and jig capacitance.

Figure 21. Total Harmonic Distortion (THD)

PACKAGING INFORMATION

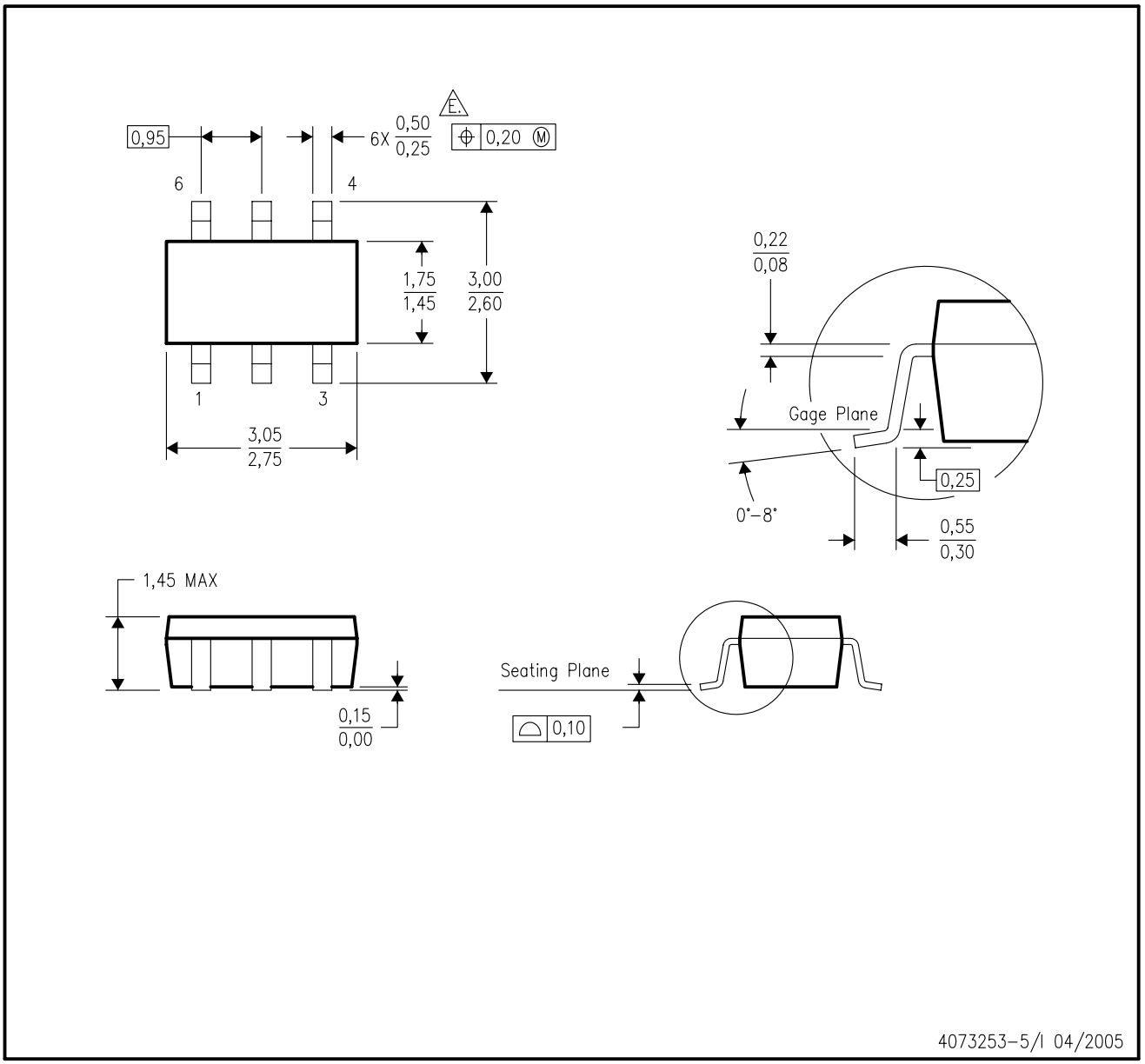
Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)
TS5A3159DBVR	ACTIVE	SOT-23	DBV	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TS5A3159DBVRE4	ACTIVE	SOT-23	DBV	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TS5A3159DBVT	ACTIVE	SOT-23	DBV	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TS5A3159DBVTE4	ACTIVE	SOT-23	DBV	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TS5A3159DCKR	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TS5A3159DCKRE4	ACTIVE	SC70	DCK	6	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TS5A3159DCKT	ACTIVE	SC70	DCK	6	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
TS5A3159DCKTE4	ACTIVE	SC70	DCK	6	250	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) 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.
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.

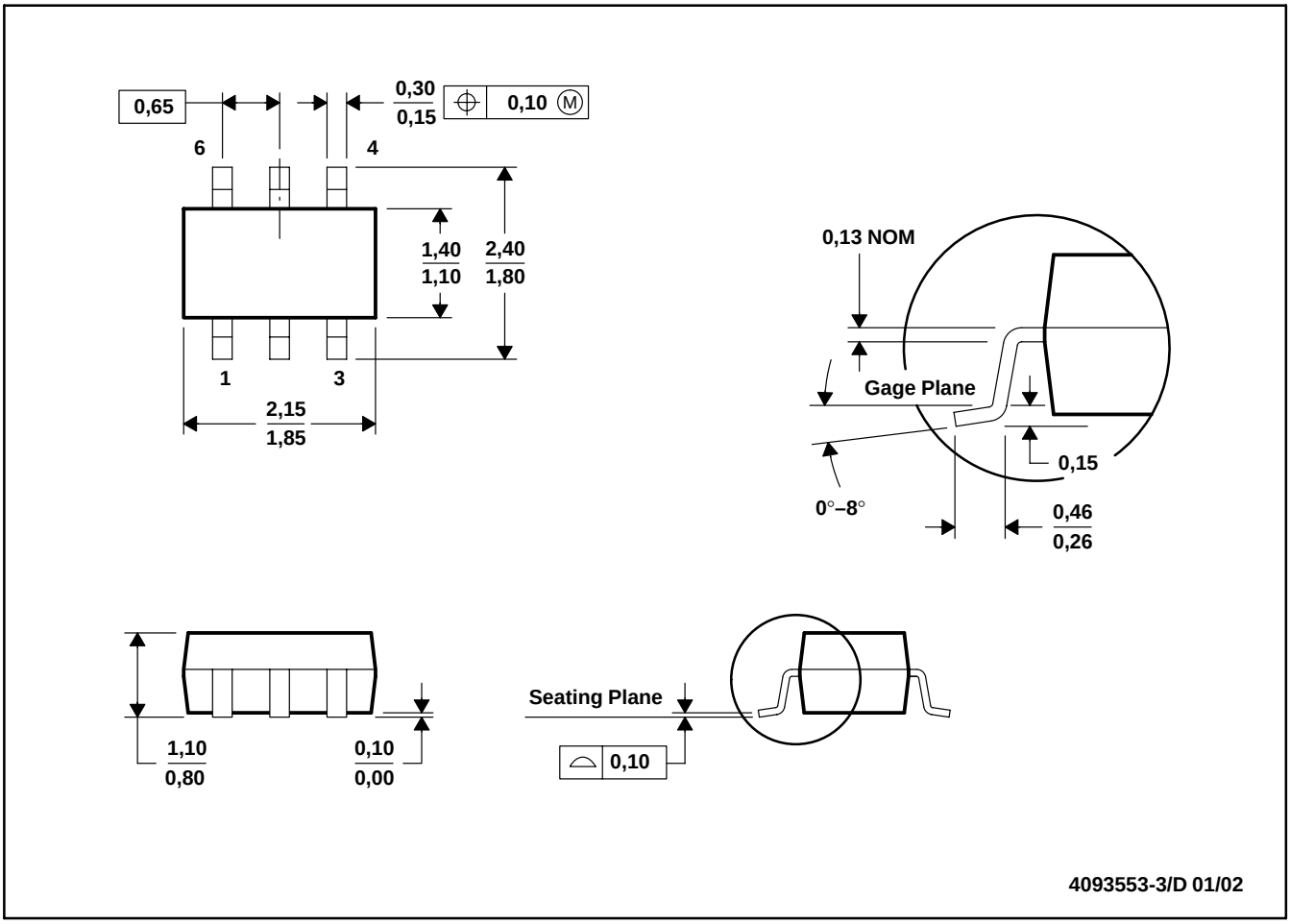
DBV (R–PDSO–G6) PLASTIC SMALL–OUTLINE PACKAGE



NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion.
D. Leads 1,2,3 may be wider than leads 4,5,6 for package orientation.
E. Falls within JEDEC MO–178 Variation AB, except minimum lead width.

MPDS114 – FEBRUARY 2002

DCK (R-PDSO-G6) **PLASTIC SMALL-OUTLINE PACKAGE**



NOTES: A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Body dimensions do not include mold flash or protrusion.
D. Falls within JEDEC MO-203

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.

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

Products		**Applications**	
Amplifiers	amplifier.ti.com	Audio	www.ti.com/audio
Data Converters	dataconverter.ti.com	Automotive	www.ti.com/automotive
DSP	dsp.ti.com	Broadband	www.ti.com/broadband
Interface	interface.ti.com	Digital Control	www.ti.com/digitalcontrol
Logic	logic.ti.com	Military	www.ti.com/military
Power Mgmt	power.ti.com	Optical Networking	www.ti.com/opticalnetwork
Microcontrollers	microcontroller.ti.com	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