# TS3A5018 $10-\Omega$ QUAD SPDT ANALOG SWITCH

SCDS189 - JANUARY 2005

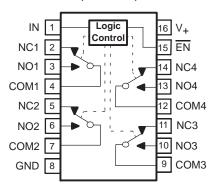
#### **Description**

The TS3A5018 is a quad single-pole double-throw (SPDT) analog switch that is designed to operate from 2.3 V to 3.6 V. This device can handle both digital and analog signals, and signals up to  $V_{+}$  can be transmitted in either direction.

### **Applications**

- Sample-and-Hold Circuit
- Battery-Powered Equipment
- Audio and Video Signal Routing
- Communication Circuits

SOIC, SSOP, TSSOP, OR TVSOP PACKAGE (TOP VIEW)



#### **FUNCTION TABLE**

ĒN	IN	NO TO COM, COM TO NO	NC TO COM, COM TO NC
L	L	OFF	ON
L	Н	ON	OFF
Н	Х	OFF	OFF

#### **Features**

- Low ON-State Resistance (10 Ω)
- Low Charge Injection
- Excellent ON-State Resistance Matching
- Low Total Harmonic Distortion (THD)
- 2.3-V to 3.6-V Single-Supply Operation
- Control Inputs are 5-V Tolerant
- 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**

 $V_{+} = 3.3 \text{ V}, T_{A} = 25^{\circ}\text{C}$ 

Configuration	Quad Single Pole Double Throw (4 × SPDT)
Number of channels	4
ON-state resistance (ron)	7 Ω
ON-state resistance match (Δr <sub>on</sub> )	0.3 Ω
ON-state resistance flatness (ron(flat))	5 Ω
Turn-on/turn-off time (tON/tOFF)	3.5 ns/2 ns
Charge injection (Q <sub>C</sub> )	2 pC
Bandwidth (BW)	300 MHz
OFF isolation (OISO)	-48 dB at 10 MHz
Crosstalk (XTALK)	-48 dB at 10 MHz
Total harmonic distortion (THD)	0.2%
Leakage current (ICOM(OFF))	±5 μA
Power-supply current (I <sub>+</sub> )	2.5 μΑ
Package option	16-pin SOIC, SSOP, TSSOP, or TVSOP



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.



#### ORDERING INFORMATION

TA	PACKAGE <sup>(1)</sup>		ORDERABLE PART NUMBER	TOP-SIDE MARKING	
	SOIC - D	Tube	TS3A5018D	TS3A5018	
	201C - D	Tape and reel	TS3A5018DR	153A5016	
-40°C to 85°C	SSOP (QSOP) - DBQ	Tape and reel	TS3A5018DBQR	YA018	
-40°C to 85°C	TSSOP - PW	Tube	TS3A5018PW	YA018	
	1330P - PW	Tape and reel	TS3A5018PWR	TAUTO	
	TVSOP - DGV	Tape and reel	TS3A5018DGVR	YA018	

<sup>(1)</sup> Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

### Absolute Minimum and Maximum Ratings(1)(2)

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

			MIN	MAX	UNIT	
V <sub>+</sub>	Supply voltage range <sup>(3)</sup>		-0.5	4.6	V	
VNC, VNO, VCOM	Analog voltage range(3)(4)		-0.5	7	V	
ΙK	Analog port diode current	V <sub>NC</sub> , V <sub>NO</sub> , V <sub>COM</sub> < 0	-50		mA	
I <sub>NC</sub> , I <sub>NO</sub> , I <sub>COM</sub>	On-state switch current	$V_{NC}$ , $V_{NO}$ , $V_{COM} = 0$ to 7 V	-64	64	mA	
٧ <sub>I</sub>	Digital input voltage range(3)(4)		-0.5	7	V	
Ικ	Digital input clamp current	V <sub>I</sub> < 0	-50		mA	
l <sub>+</sub>	Continuous current through V+		-100	100	mA	
IGND	Continuous current through GND		-100	100	mA	
		D package		73		
	Davidson (5)	DBQ package		90	0000	
θJA	Package thermal impedance(5)	DGV package		120	°C/W	
		PW package		108		
T <sub>stg</sub>	Storage temperature range		-65	150	°C	

<sup>(1)</sup> Stresses above these ratings may cause permanent damage. Exposure to absolute maximum conditions for extended periods may degrade device reliability. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those specified is not implied.

<sup>(2)</sup> The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum

<sup>(3)</sup> All voltages are with respect to ground, unless otherwise specified.

<sup>(4)</sup> The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.

<sup>(5)</sup> The package thermal impedance is calculated in accordance with JESD 51-7.



# Electrical Characteristics for 3.3-V Supply<sup>(1)</sup> $V_+ = 3 \text{ V to } 3.6 \text{ V}, T_A = -40 ^{\circ}\text{C} \text{ to } 85 ^{\circ}\text{C} \text{ (unless otherwise noted)}$

PARAMETER	SYMBOL	TEST CONDITIONS		TA	٧+	MIN	TYP	MAX	UNIT
Analog Switch									
Analog signal range	VCOM, VNC, VNO					0		٧+	V
ON-state resistance	r <sub>on</sub>	$0 \le (V_{NC} \text{ or } V_{NO}) \le V_+,$ $I_{COM} = -32 \text{ mA},$	Switch ON, See Figure 13	25°C Full	3 V		7	10 12	Ω
ON-state resistance match between channels	Δr <sub>on</sub>	$V_{NC}$ or $V_{NO} = 2.1 \text{ V}$ , $I_{COM} = -32 \text{ mA}$ ,	Switch ON, See Figure 13	25°C Full	3 V		0.3	0.8	Ω
ON-state resistance flatness	ron(flat)	$0 \le (V_{NC} \text{ or } V_{NO}) \le V_+,$ $I_{COM} = -32 \text{ mA},$	Switch ON, See Figure 13	25°C Full	3 V		5	7	Ω
		$V_{NC}$ or $V_{NO} = 1 \text{ V}, V_{COM} = 3 \text{ V},$	Switch OFF, See Figure 14	25°C Full	3.6 V	-0.1 -0.2	0.05	0.1	
NC, NO OFF leakage current	INC(OFF) INO(OFF)	V <sub>NC</sub> or V <sub>NO</sub> = 3 V, V <sub>COM</sub> = 1 V, V <sub>NC</sub> or V <sub>NO</sub> = 0 to 3.6 V, V <sub>COM</sub> = 3.6 V to 0,	Switch OFF,	25°C	0 V	-2	0.05	2	μΑ
		V <sub>NC</sub> or V <sub>NO</sub> = 3.6 V to 0, V <sub>COM</sub> = 0 to 3.6 V,	See Figure 14	Full	O V	-10		10	10
		$V_{COM} = 1 \text{ V}, V_{NC} \text{ or } V_{NO} = 3 \text{ V},$	Switch OFF, See Figure 14	25°C	3.6 V	-0.1	0.05	0.1	
COM OFF leakage current	ICOM(OFF)	V <sub>COM</sub> = 3 V, V <sub>NC</sub> or V <sub>NO</sub> = 3 V, V <sub>COM</sub> = 0 to 3.6 V, V <sub>NC</sub> or V <sub>NO</sub> = 3.6 V to 0,	Switch OFF,	Full 25°C		-0.2 -2	0.05	2	μΑ
ouncin		or V <sub>COM</sub> = 3.6 V to 0, V <sub>NC</sub> or V <sub>NO</sub> = 0 to 3.6 V,	See Figure 14	Full	0 V	-10		10	-
NC, NO ON leakage	INC(ON)	V <sub>NC</sub> or V <sub>NO</sub> = 1 V, V <sub>COM</sub> = Open, or	Switch ON, See Figure 15	25°C	3.6 V	-0.1	0.05	0.1	μΑ
current	I <sub>NO(ON)</sub>	$V_{NC}$ or $V_{NO} = 3 V$ , $V_{COM} = Open$ ,	See Figure 13	Full		-0.2		0.2	•
COM ON leakage	ICOM(ON)	$V_{COM} = 1 \text{ V, } V_{NC} \text{ or } V_{NO} = \text{Open,}$ or $V_{COM} = 1 \text{ V, } V_{NC} \text{ or } V_{NO} = \text{Open,}$	Switch ON, See Figure 15	25°C Full	3.6 V	-0.1 -0.2	0.05	0.1	μΑ
Digital Control Inp	ute (IN EN	$V_{COM} = 3 \text{ V}, V_{NC} \text{ or } V_{NO} = \text{Open},$		Full		-0.2		0.2	
Input logic high	1			Full		2		V <sub>+</sub>	V
Input logic low	V <sub>IH</sub> V <sub>IL</sub>			Full		0		0.8	V
Input leakage	I <sub>IH</sub> , I <sub>IL</sub>	V <sub>I</sub> = 5.5 V or 0		25°C	3.6 V	-1	0.05	1	μΑ

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

<sup>(2)</sup> All unused digital inputs of the device must be held at V<sub>+</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications* of Slow or Floating CMOS Inputs, literature number SCBA004.

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# Electrical Characteristics for 3.3-V Supply<sup>(1)</sup> (continued) $V_+ = 3 \text{ V to } 3.6 \text{ V}, T_A = -40^{\circ}\text{C to } 85^{\circ}\text{C (unless otherwise noted)}$

PARAMETER	SYMBOL	TEST COND	ITIONS	TA	٧+	MIN	TYP	MAX	UNIT
Dynamic	•				•	•			
Turn-on time	ton	V <sub>COM</sub> = 2 V,	C <sub>L</sub> = 35 pF,	25°C	3.3 V	2.5	3.5	8	ns
Turr on time	tON	$R_L = 300 \Omega$ ,	See Figure 17	Full	3 V to 3.6 V	2.5		9	115
Turn-off time	tOFF	V <sub>COM</sub> = 2 V,	$C_L = 35 pF$ ,	25°C	3.3 V	0.5	2	6.5	ns
	*OFF	$R_L = 300 \Omega$	See Figure 17	Full	3 V to 3.6 V	0.5		7	110
Charge injection	QC	V <sub>GEN</sub> = 0, R <sub>GEN</sub> = 0 C <sub>L</sub> = 0.1 nF,	See Figure 22	25°C	3.3 V		2		рС
NC, NO OFF capacitance	C <sub>NC(OFF)</sub> C <sub>NO(ON)</sub>	$V_{NC}$ or $V_{NO} = V_{+}$ or GND, Switch OFF,	See Figure 16	25°C	3.3 V		4.5		pF
COM OFF capacitance	CCOM(OFF)	V <sub>COM</sub> = V <sub>+</sub> or GND, Switch OFF,	See Figure 16	25°C	3.3 V		9		pF
NC, NO ON capacitance	C <sub>NC(ON)</sub>	$V_{NC}$ or $V_{NO} = V_{+}$ or GND, Switch ON,	See Figure 16	25°C	3.3 V		16		pF
COM ON capacitance	C <sub>COM(ON)</sub>	V <sub>COM</sub> = V <sub>+</sub> or GND, Switch ON,	See Figure 16	25°C	3.3 V		16		pF
Digital input capacitance	Cl	$V_I = V_+ \text{ or GND},$	See Figure 16	25°C	3.3 V		3		pF
Bandwidth	BW	$R_L = 50 \Omega$ , Switch ON,	See Figure 18	25°C	3.3 V		300		MHz
OFF isolation	O <sub>ISO</sub>	$R_L = 50 \Omega$ , f = 10 MHz,	Switch OFF, See Figure 19	25°C	3.3 V		-48		dB
Crosstalk	X <sub>TALK</sub>	$R_L = 50 \Omega$ , f = 10 MHz,	Switch ON, See Figure 20	25°C	3.3 V		-48		dB
Crosstalk Adjacent	XTALK(ADJ)	$R_L = 50 \Omega$ , $f = 10 MHz$ ,	Switch ON, See Figure 21	25°C	3.3 V		-81		dB
Total harmonic distortion	THD	$R_L = 600 \Omega,$ $C_L = 50 pF,$	f = 20 Hz to 20 kHz, See Figure 23	25°C	3.3 V		0.21		%
Supply	•				•				
Positive supply		V V or CND	Switch ON or OFF	25°C	261/		2.5	7	^
current	I <sub>+</sub>	$V_I = V_+ \text{ or GND},$	Switch ON or OFF	Full	3.6 V			10	μΑ

<sup>(1)</sup> 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<sup>(1)</sup> $V_+ = 2.3 \text{ V to } 2.7 \text{ V, } T_A = -40 ^{\circ}\text{C} \text{ to } 85 ^{\circ}\text{C} \text{ (unless otherwise noted)}$

PARAMETER	SYMBOL	TEST CONDITIONS		TA	٧+	MIN	TYP	MAX	UNIT
Analog Switch									
Analog signal range	VCOM, VNC, VNO					0		٧+	V
ON-state resistance	r <sub>on</sub>	$0 \le (V_{NC} \text{ or } V_{NO}) \le V_+,$ $I_{COM} = -24 \text{ mA},$	Switch ON, See Figure 13	25°C Full	2.3 V		12	20 22	Ω
ON-state resistance match	Ar	$V_{NC}$ or $V_{NO} = 1.6 V$ ,	Switch ON,	25°C	2.3 V		0.3	1	Ω
between channels	∆r <sub>on</sub>	$I_{COM} = -24 \text{ mA},$	See Figure 13	Full	2.3 V			2	52
ON-state resistance	r = = (f(= t)	$0 \le (V_{NC} \text{ or } V_{NO}) \le V_+,$	Switch ON,	25°C	2.3 V		14	18	Ω
flatness	ron(flat)	$I_{COM} = -24 \text{ mA},$	See Figure 13	Full	2.5 V			20	32
		$V_{NC}$ or $V_{NO} = 0.5 \text{ V}$ , $V_{COM} = 2.2 \text{ V}$ ,	Switch OFF,	25°C	2.7 V	-0.1	0.05	0.1	
NC, NO		$V_{NC}$ or $V_{NO} = 2.2 \text{ V}$ , $V_{COM} = 0.5 \text{ V}$ ,	See Figure 14	Full	2.7 V	-0.2		0.2	
OFF leakage current	INC(OFF), INO(OFF)	V <sub>NC</sub> or V <sub>NO</sub> = 0 to 3.6 V, V <sub>COM</sub> = 3.6 V to 0,	Switch OFF,	25°C	0 V	-2	0.05	2	μА
		$V_{NC}$ or $V_{NO} = 3.6 \text{ V}$ to 0, $V_{COM} = 0$ to 3.6 V,	See Figure 14	Full	O V	-10		10	
		$V_{COM} = 0.5 \text{ V}, V_{NC} \text{ or } V_{NO} = 2.2 \text{ V},$	Switch OFF,	25°C	0.7.1/	-0.1	0.05	0.1	
COM OFF leakage	loor warm	$V_{COM} = 2.2 \text{ V}, V_{NC} \text{ or } V_{NO} = 0.5 \text{ V},$	See Figure 14	Full	2.7 V	-0.2		0.2	
current	COM(OFF)	$V_{COM} = 0 \text{ to } 3.6 \text{ V}, V_{NC} = 3.6 \text{ V to } 0,$	Switch OFF,	25°C	0 V	-2	0.05	2	μΑ
		$V_{COM} = 3.6 \text{ V to 0}, V_{NC} = 0 \text{ to } 3.6 \text{ V},$	See Figure 14	Full	0 0	-10		10	
NC, NO ON leakage	INC(ON)	$V_{NC}$ or $V_{NO} = 0.5 \text{ V}$ , $V_{COM} = \text{Open}$ ,	Switch ON,	25°C	2.7 V	-0.1	0.05	0.1	μA
current	INO(ON)	$V_{NC}$ or $V_{NO} = 2.2 \text{ V}$ , $V_{COM} = \text{Open}$ ,	See Figure 15	Full	2.7 V	-0.2		0.2	μΑ
COM		$V_{COM} = 0.5 \text{ V}, V_{NC} \text{ or } V_{NO} = \text{Open},$	Switch ON,	25°C	0.71/	-0.1	0.05	0.1	
ON leakage current	ICOM(ON)	$V_{COM} = 2.2 \text{ V}, V_{NC} \text{ or } V_{NO} = \text{Open},$	See Figure 15	Full	2.7 V	-0.2		0.2	μΑ
Digital Control Inp	outs (IN, EN)	(2)							
Input logic high	VIH			Full		1.7		٧+	V
Input logic low	V <sub>IL</sub>			Full		0		0.7	V
Input leakage current	I <sub>IH</sub> , I <sub>IL</sub>	V <sub>I</sub> = 5.5 V or 0		25°C Full	2.7 V	-0.1 -1	0.05	0.1	μΑ

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

<sup>(2)</sup> All unused digital inputs of the device must be held at V<sub>+</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications* of Slow or Floating CMOS Inputs, literature number SCBA004.

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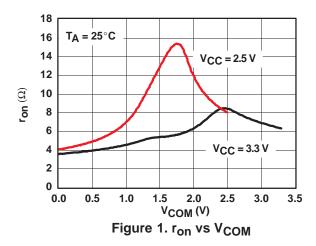
# Electrical Characteristics for 2.5-V Supply<sup>(1)</sup> (continued) $V_+ = 2.3 \text{ V}$ to 2.7 V, $T_A = -40 ^{\circ}\text{C}$ to 85°C (unless otherwise noted)

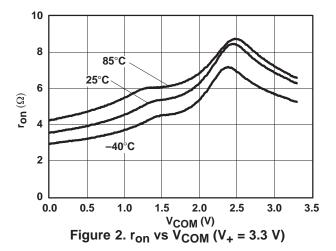
PARAMETER	SYMBOL	TEST COND	DITIONS	TA	٧+	MIN	TYP	MAX	UNIT
Dynamic					-				
Turn-on time		V <sub>COM</sub> = 1.5 V,	C <sub>L</sub> = 35 pF,	25°C	2.5 V	2.5	5	9.5	
rum-on time	tON	$R_L = 300 \Omega$	See Figure 17	Full	2.3 V to 2.7 V	2.5		10.5	ns
Turn-off time	to==	V <sub>COM</sub> = 1.5 V,	$C_L = 35 pF$ ,	25°C	2.5 V	0.5	3	7.5	200
Turr-on time	tOFF	$R_L = 300 \Omega$ ,	See Figure 17	Full	2.3 V to 2.7 V	0.5		9	ns
Charge injection	QC	V <sub>GEN</sub> = 0, R <sub>GEN</sub> = 0 C <sub>L</sub> = 0.1 nF,	See Figure 22	25°C	2.5 V		1		рС
NC, NO OFF capacitance	C <sub>NC(OFF)</sub> C <sub>NO(OFF)</sub>	$V_{NC}$ or $V_{NO} = V_{+}$ or GND, Switch OFF,	See Figure 16	25°C	2.5 V		3		pF
COM OFF capacitance	CCOM(OFF)	V <sub>COM</sub> = V <sub>+</sub> or GND, Switch OFF,	See Figure 16	25°C	2.5 V		9		pF
NC, NO ON capacitance	C <sub>NC(ON)</sub>	$V_{NC}$ or $V_{NO} = V_{+}$ or GND, Switch ON,	See Figure 16	25°C	2.5 V		16		pF
COM ON capacitance	C <sub>COM(ON)</sub>	V <sub>COM</sub> = V <sub>+</sub> or GND, Switch ON,	See Figure 16	25°C	2.5 V		16		pF
Digital input capacitance	Cl	$V_I = V_+$ or GND,	See Figure 16	25°C	2.5 V		3		pF
Bandwidth	BW	$R_L = 50 \Omega$ , Switch ON,	See Figure 18	25°C	2.5 V		300		MHz
OFF isolation	O <sub>ISO</sub>	$R_L = 50 \Omega$ , f = 10 MHz,	Switch OFF, See Figure 19	25°C	2.5 V		-48		dB
Crosstalk	XTALK	$R_L = 50 \Omega$ , f = 10 MHz,	Switch ON, See Figure 20	25°C	2.5 V		-48		dB
Crosstalk Adjacent	XTALK(ADJ)	$R_L = 50 \Omega$ , $f = 10 MHz$ ,	Switch ON, See Figure 21	25°C	3.3 V		-81		dB
Total harmonic distortion	THD	$R_L = 600 \Omega,$ $C_L = 50 pF,$	f = 20 Hz to 20 kHz, See Figure 23	25°C	2.5 V		0.33		%
Supply									
Positive supply current	1+	$V_I = V_+$ or GND,	Switch ON or OFF	25°C Full	2.7 V		2.5	7 10	μΑ

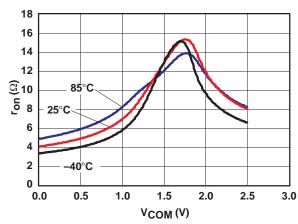
<sup>(1)</sup> The algebraic convention, whereby the most negative value is a minimum and the most positive value is a maximum



#### **TYPICAL PERFORMANCE**







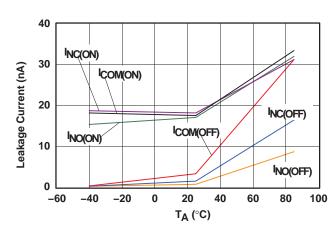
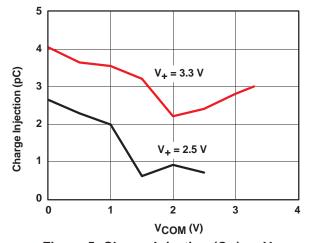


Figure 3.  $r_{on}$  vs  $V_{COM}$  ( $V_{+} = 3.3 \text{ V}$ )

Figure 4. Leakage Current vs Temperature  $(V_+ = 3.6 \text{ V})$ 



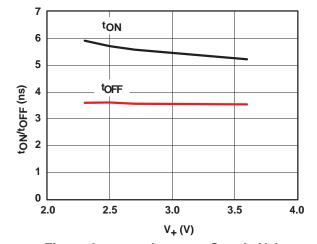
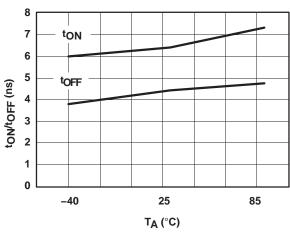


Figure 5. Charge-Injection (Q<sub>C</sub>) vs V<sub>COM</sub>

Figure 6.  $t_{ON}$  and  $t_{OFF}$  vs Supply Voltage



#### **TYPICAL PERFORMANCE**



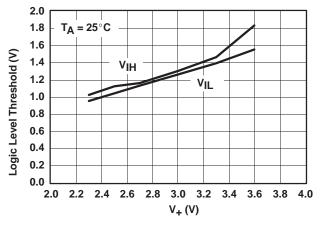
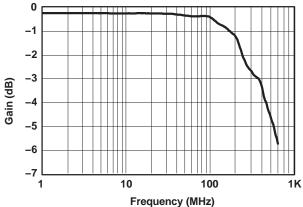
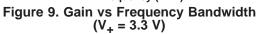


Figure 7.  $t_{ON}$  and  $t_{OFF}$  vs Temperature (V<sub>+</sub> = 5 V)

Figure 8. Logic-Level Threshold vs V+





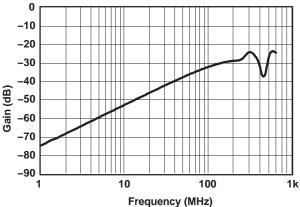


Figure 10. OFF Isolation vs Frequency ( $V_{+} = 3.3 \text{ V}$ )

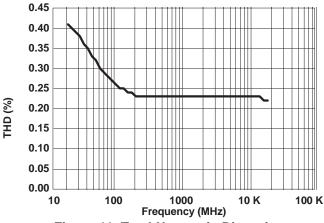


Figure 11. Total Harmonic Distortion vs Frequency

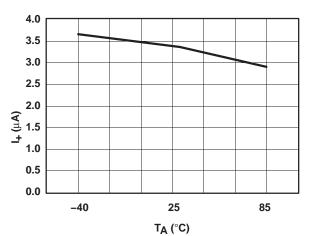


Figure 12. Power-Supply Current vs Temperature ( $V_+ = 3.3 \text{ V}$ )



### PIN DESCRIPTION

PIN NUMBER	NAME	DESCRIPTION
1	IN	Digital control pin to select between NC and NO
2	NC1	Normally closed
3	NO1	Normally open
4	COM1	Common
5	NC2	Normally closed
6	NO2	Normally open
7	COM2	Common
8	GND	Digital ground
9	COM3	Common
10	NO3	Normally open
11	NC3	Normally closed
12	COM4	Common
13	NO4	Normally open
14	NC4	Normally closed
15	EN	Chip Enable (active low)
16	V <sub>+</sub>	Power supply



#### PARAMETER DESCRIPTION

SYMBOL	DESCRIPTION
V <sub>C</sub> OM	Voltage at COM
VNC	Voltage at NC
V <sub>NO</sub>	Voltage at NO
r <sub>on</sub>	Resistance between COM and NC or NO ports when the channel is ON
$\Delta r_{\sf on}$	Difference of ron between channels in a specific device
ron(flat)	Difference between the maximum and minimum value of ron in a channel over the specified range of conditions
INC(OFF)	Leakage current measured at the NC port, with the corresponding channel (NC to COM) in the OFF state
I <sub>NC</sub> (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 <sub>NO(OFF)</sub>	Leakage current measured at the NO port, with the corresponding channel (NO to COM) in the OFF state
I <sub>NO(ON)</sub>	Leakage current measured at the NO port, with the corresponding channel (NO to COM) in the ON state and the output (COM) open
ICOM(OFF)	Leakage current measured at the COM port, with the corresponding channel (COM to NC or NO) in the OFF state
ICOM(ON)	Leakage current measured at the COM port, with the corresponding channel (COM to NC or NO) in the ON state and the output (NC or NO) open
VIH	Minimum input voltage for logic high for the control input (IN, EN)
V <sub>IL</sub>	Maximum input voltage for logic low for the control input (IN, EN)
VI	Voltage at the control input (IN, EN)
I <sub>IH</sub> , I <sub>IL</sub>	Leakage current measured at the control input (IN, EN)
tON	Turn-on time for the switch. This parameter is measured under the specified range of conditions and by the propagation delay between the digital control (IN) signal and analog output (NC or NO) signal when the switch is turning ON.
<sup>t</sup> OFF	Turn-off time for the switch. This parameter is measured under the specified range of conditions and by the propagation delay between the digital control (IN) signal and analog output (NC or NO) signal when the switch is turning OFF.
QC	Charge injection is a measurement of unwanted signal coupling from the control (IN) input to the analog (NC or NO) output. This is measured in coulomb (C) and measured by the total charge induced due to switching of the control input. Charge injection, $Q_C = C_L \times \Delta V_{COM}$ , $C_L$ is the load capacitance, and $\Delta V_{COM}$ is the change in analog output voltage.
C <sub>NC(OFF)</sub>	Capacitance at the NC port when the corresponding channel (NC to COM) is OFF
C <sub>NC(ON)</sub>	Capacitance at the NC port when the corresponding channel (NC to COM) is ON
C <sub>NO(OFF)</sub>	Capacitance at the NC port when the corresponding channel (NO to COM) is OFF
C <sub>NO(ON)</sub>	Capacitance at the NC port when the corresponding channel (NO to COM) is ON
C <sub>COM(OFF)</sub>	Capacitance at the COM port when the corresponding channel (COM to NC) is OFF
CCOM(ON)	Capacitance at the COM port when the corresponding channel (COM to NC) is ON
Cl	Capacitance of control input (IN, EN)
O <sub>ISO</sub>	OFF isolation of the switch is a measurement of OFF-state switch impedance. This is measured in dB in a specific frequency, with the corresponding channel (NC to COM) in the OFF state.
XTALK	Crosstalk is a measurement of unwanted signal coupling from an ON channel to an OFF channel (NC1 to NO1). Adjacent crosstalk is a measure of unwanted signal coupling from an ON channel to an adjacent ON channel (NC1 to NC2). This is measured in a specific frequency and in dB.
BW	Bandwidth of the switch. This is the frequency in which the gain of an ON channel is -3 dB below the DC gain.
THD	Total harmonic distortion describes the signal distortion caused by the analog switch. This is defined as the ratio of root mean square (RMS) value of the second, third, and higher harmonic to the absolute magnitude of the fundamental harmonic.
I <sub>+</sub>	Static power-supply current with the control (IN) pin at V <sub>+</sub> or GND



#### PARAMETER MEASUREMENT INFORMATION

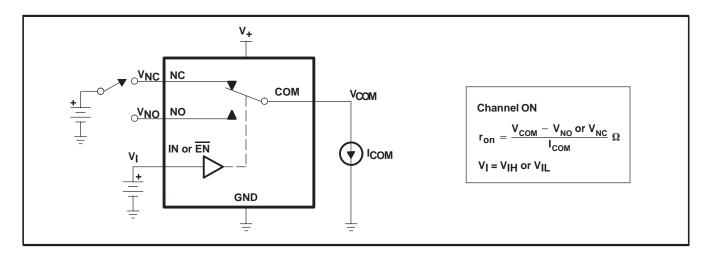


Figure 13. ON-State Resistance (ron)

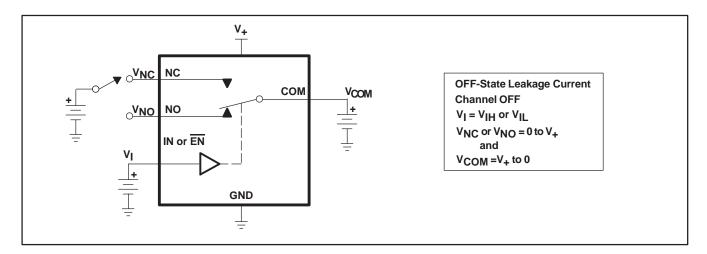


Figure 14. OFF-State Leakage Current (I<sub>COM(OFF)</sub>, I<sub>NC(OFF)</sub>, I<sub>NO(OFF)</sub>

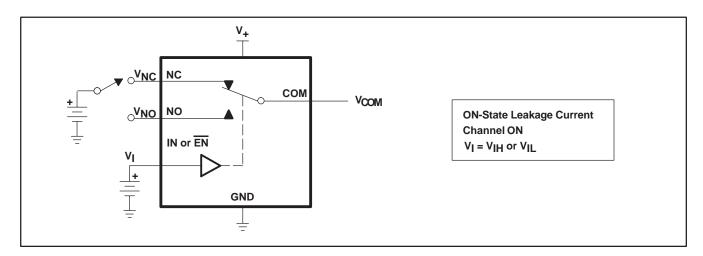


Figure 15. ON-State Leakage Current ( $I_{COM(ON)}$ ,  $I_{NC(ON)}$ )



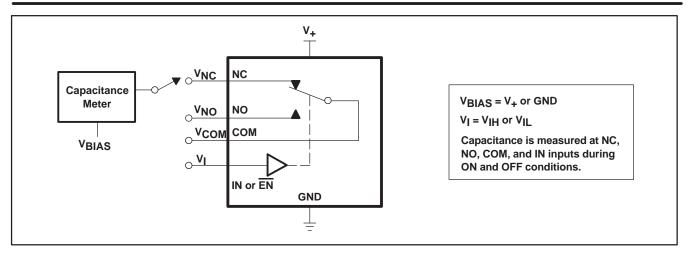
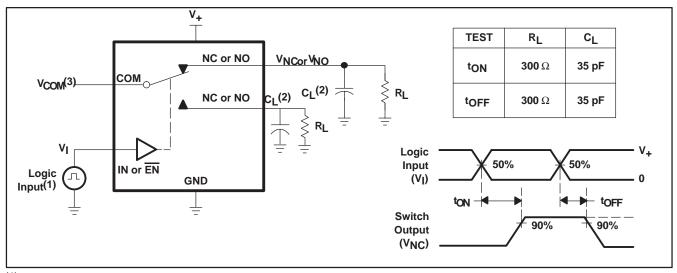


Figure 16. Capacitance (C<sub>I</sub>,  $C_{COM(OFF)}$ ,  $C_{COM(ON)}$ ,  $C_{NC(OFF)}$ ,  $C_{NC(ON)}$ )



- (1) All input pulses are supplied by generators having the following characteristics: PRR  $\leq$  10 MHz, Z<sub>O</sub> = 50  $\Omega$ , t<sub>f</sub> < 5 ns. t<sub>f</sub> < 5 ns.
- (2) C<sub>L</sub> includes probe and jig capacitance.
- (3) See Electrical Characteristics for V<sub>COM</sub>.

Figure 17. Turn-On (t<sub>ON</sub>) and Turn-Off Time (t<sub>OFF</sub>)

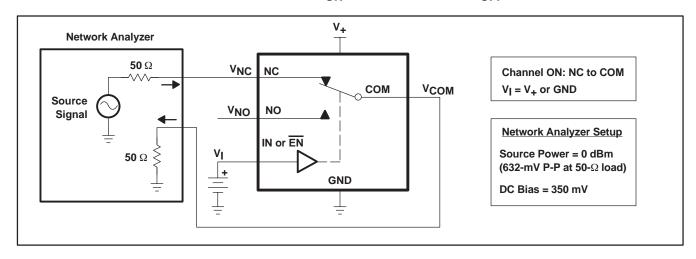


Figure 18. Bandwidth (BW)



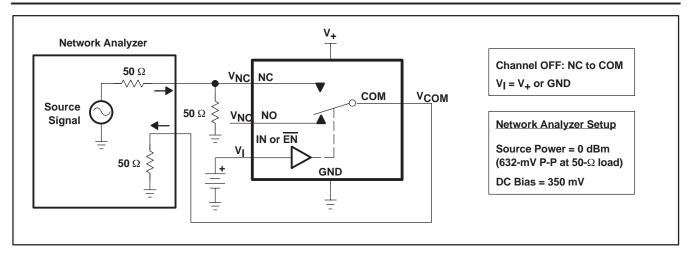


Figure 19. OFF Isolation (O<sub>ISO</sub>)

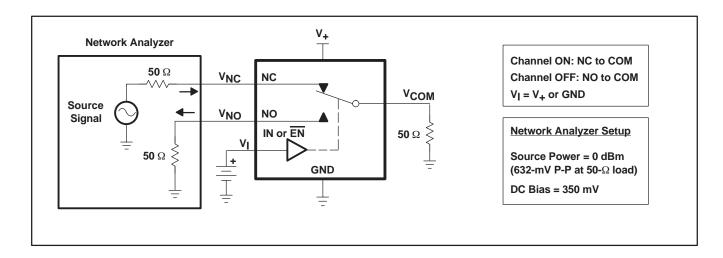


Figure 20. Crosstalk (X<sub>TALK</sub>)

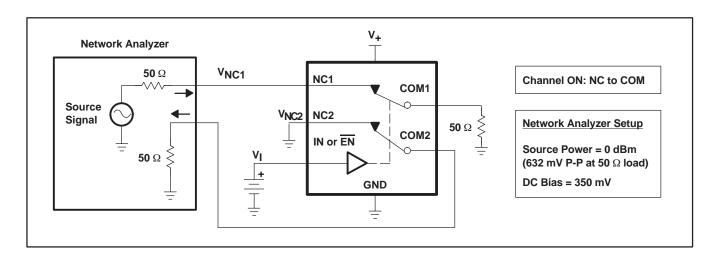
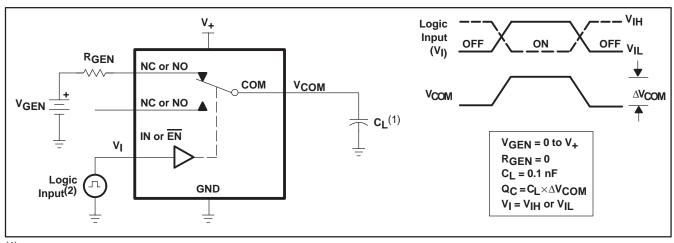


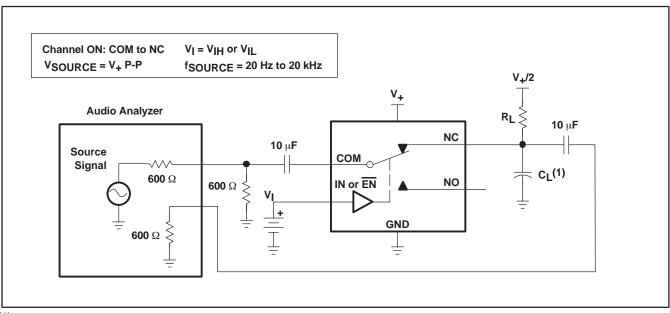
Figure 21. Crosstalk Adjacent





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

Figure 22. Charge Injection (Q<sub>C</sub>)



(1) C<sub>L</sub> includes probe and jig capacitance.

Figure 23. Total Harmonic Distortion (THD)

#### DGV (R-PDSO-G\*\*)

#### **24 PINS SHOWN**

#### **PLASTIC SMALL-OUTLINE**



NOTES: A. All linear dimensions are in millimeters.

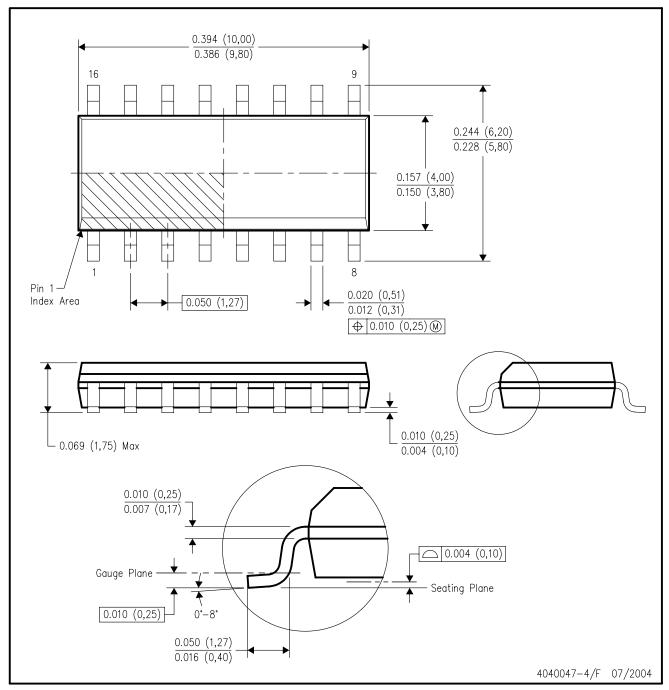
B. This drawing is subject to change without notice.

C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.

D. Falls within JEDEC: 24/48 Pins – MO-153 14/16/20/56 Pins – MO-194

# D (R-PDSO-G16)

# PLASTIC SMALL-OUTLINE PACKAGE



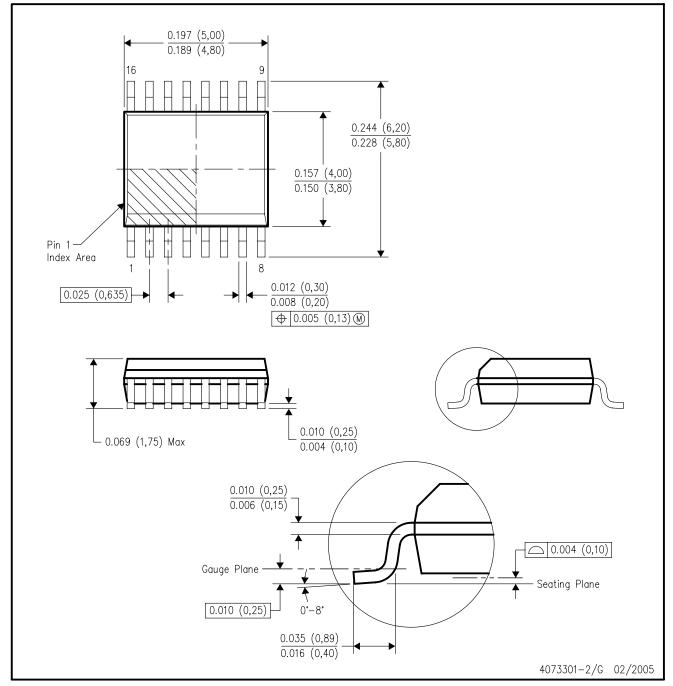
NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
- D. Falls within JEDEC MS-012 variation AC.



# DBQ (R-PDSO-G16)

# PLASTIC SMALL-OUTLINE PACKAGE



NOTES:

- A. All linear dimensions are in inches (millimeters).
- B. This drawing is subject to change without notice.
- C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15) per side.
- D. Falls within JEDEC MO-137 variation AB.



#### PW (R-PDSO-G\*\*)

#### 14 PINS SHOWN

#### 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 not to exceed 0,15.

D. Falls within JEDEC MO-153

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